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THESIS

ANALYSIS OF LOW BIDDING AND CHANGE ORDER RATES FOR NAVY FACILITIES CONSTRUCTION CONTRACTS

by

James R. Rosmond

June 1984

Thesis Advisor: D. C. Boger

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Analysis of Low Bidding and Change Order Rates for Navy Facilities Construction Contracts

by

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Lieutenant Commander, United States Navy
B.S., University of Washington, 1974

Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

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I. INTRODUCTION

The U. S. Government enters into a large number of contracts with the private sector because it has an interest in encouraging private action to accomplish its goals. Contracts are written, agreed to, and executed with the purpose of fulfilling the needs of Government agencies. In doing so, however, many contracts experience cost overruns because of imperfect wording of contract provisions, technical difficulties experienced by contractors, changes in Government mission requirements, or other reasons.

One cause of cost overruns is the change order--a modification issued unilaterally by a Government contracting officer directing the contractor to make changes within certain regulatory limits. The change order is issued during the life of the contract and usually directs certain actions in exchange for compensation to the contractor. The intent of the change order is to benefit both the Government and the private contractor in seeking equitable solutions to otherwise untenable situations. The change order is considered a tool of the Government to provide flexibility during contract administration, but its value is fully realized only when used with restraint. Contract managers sometimes permit change order to be used excessively, especially when they make liberal or lenient interpretations of change order regulations and policies.

The contractor is motivated by the need to survive and to make profits. It is understandable that changes to a contract would be priced at a premium if the prices were solely determined by the contractor, so payments for changes are negotiated at what is considered to be "equitable adjustment."[1] Critics of Government overspending cite instances of wasteful overruns on Government contracts as testimony to the mismanagement of funds. It is the Government's duty to use these funds strictly for the public good. Since private concerns are subordinate to the public good, the Government has an equal interest in assuring that private individuals to not benefit at its expense.

The process of cost overruns may be exemplified in Government construction contracting by significant numbers of change orders. Construction contracting is unique because virtually every facility differs from others in terms of function and description. Whenever a new and creative architectural concept is expressed in a set of drawings and specifications, it is difficult to insure that all the details are flawlessly coordinated.

This thesis will analyze problems associated with change orders for construction contracts and attempt to identify variables that significantly affect change order occurences. The motivation of contractors is of primary concern in determining whether they have been successful in attaining profits and in improving their positions as a result of overreliance on changes to contracts.

Chapter II provides a background for the concepts of competitive bidding and contract change orders. A perspective of the bidding contractor is taken to examine his motives and strategies prior to bidding. Several measures of "level of competitiveness" are introduced from bidding theory literature that will be employed in the analysis chapter of this thesis. The means by which change orders can be made are examined. The general hypothesis of this thesis is then presented after the reader is introduced to these concepts.

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[1] The determinant of what constitutes an "equitable adjustment" has never been objectively qualified or quantified. It is construed in the ordinary meaning to connote a "fair," "reasonable," "just," or "right" arrangement or settlement.

Chapter III is the presentation and analysis of a model constructed of actual data from one of the Naval Facilities Engineering Command's (NAVFAC) Engineering Field Divisions (EFD). Recently awarded construction contracts of Western Division, Naval Facilities Engineering Command (WESTDIV) are analyzed using the concepts introduced in Chapter II. Appendices A and B provide a description and listing of the variables used for the analysis.

Chapter IV summarizes the thesis and the findings discovered in analysis. In addition, some general conclusions are made which are either supported by the findings or which attempt to explain inconclusive results. Finally, recommendations for future, related research are made.

II. BACKGROUND

A. GENERAL

1. Competitive Bidding

The Department of Defense (DOD) is the largest contracting agency in the federal government, with annual awards running well over $100 billion in the early 1980's. By the end of the decade this figure is likely to double. Congress and others concerned with federal spending and accountability have paid particularly close attention to DOD because most of this money is spent noncompetitively. In Fiscal Year 1981, of $105.2 billion worth of prime contracts, only 7.6 percent of this money was involved in competitively-awarded contracts [Ref. 1: p. 106].

This concern generated the creation of the Office of Federal Procurement Policy as an agency to prescribe regulations and policies for federal procurement that would foster more competitive pricing [Ref. 1: pp. 241-245]. The Federal Budget in 1982 projected total government outlays for shore facility construction and rehabilitation in excess of $30 billion [Ref. 2: p. 1]. The Navy Department's share of this amount was approximately $830 million.[2] The Naval Facilities Engineering Command (NAVFAC), which administers most of this money, traditionally awards its construction contracts on a competitive, lump-sum basis. Competitive procurement then, is a consistent practice among the few.

---

[2] The Federal Budget projected this amount for Fiscal Year 1982 Navy Department Military Construction outlays. This included money for for active and reserve Navy and Marine Corps components. It did not include construction funded from other sources, such as Non-Appropriated Funds, Defense Family Housing, and Operations and Maintenance appropriations.

Competitive bidding, however has not escaped criticism. Former General Counsel for the Department of the Navy F. Trowbridge Vom Baur once argued during a Senate hearing that fierce competition is not in DOD's interest because it forces contractors to offer "bare bones" prices that could cause them to go out of business. As a result the contractor, Vom Baur stated, is forced to find a way to recover any foregone contingency for claims after the contract is awarded. This could be done he claimed, as a result of changes desired by the Government during the performance of the contract work. Furthermore, he contended that competitive procurement attracts only "marginal producers" interested in low profit business. Referring to complex systems procurement, he explained that claims would occur more often when contracts are competed than when they are negotiated. [Ref. 3: pp. 120-121]

A supporting argument is that the competitive bidding process carries with it a heavy financial burden on the Government and spawns some ridiculous practices. "Competitive bidding causes government to be a bad customer and, therefore, get bad treatment from the vendor." The contractor is obliged to cut services where possible and act particularly stingy and uncooperative when the contractor learns that some significant feature or requirement was left out of the original contract documents. [Ref. 4]

Ample testimony has been given to refute the criticisms of competitive bidding [Ref. 5]. Senator Proxmire challenged Vom Baur's statements with convincing counterargument. Nevertheless, a competitively bid, fixed price contract imparts more risk upon a contractor than any other common form of contractual agreement. The "Changes" clause in Government contracts was therefore adopted for the mutual benefit of the contracting officer and the contractor [Ref. 6: p. 38].

2. The "Changes" Clause

The concept that the Government should have the right to order changes to the work under a contract has been a part of the Government contracting process for years. The "Changes" clause (see Figure 2.1) gives the Government the flexibility to purchase work or effort directly from an existing contractor without the necessity of following the statutes which require procurement pursuant to the formal advertising method. Provided a change is "within the general scope of the contract," a Contracting Officer may bypass a great deal of administrative effort by negotiating the cost of a work change directly with the original contractor.[3]

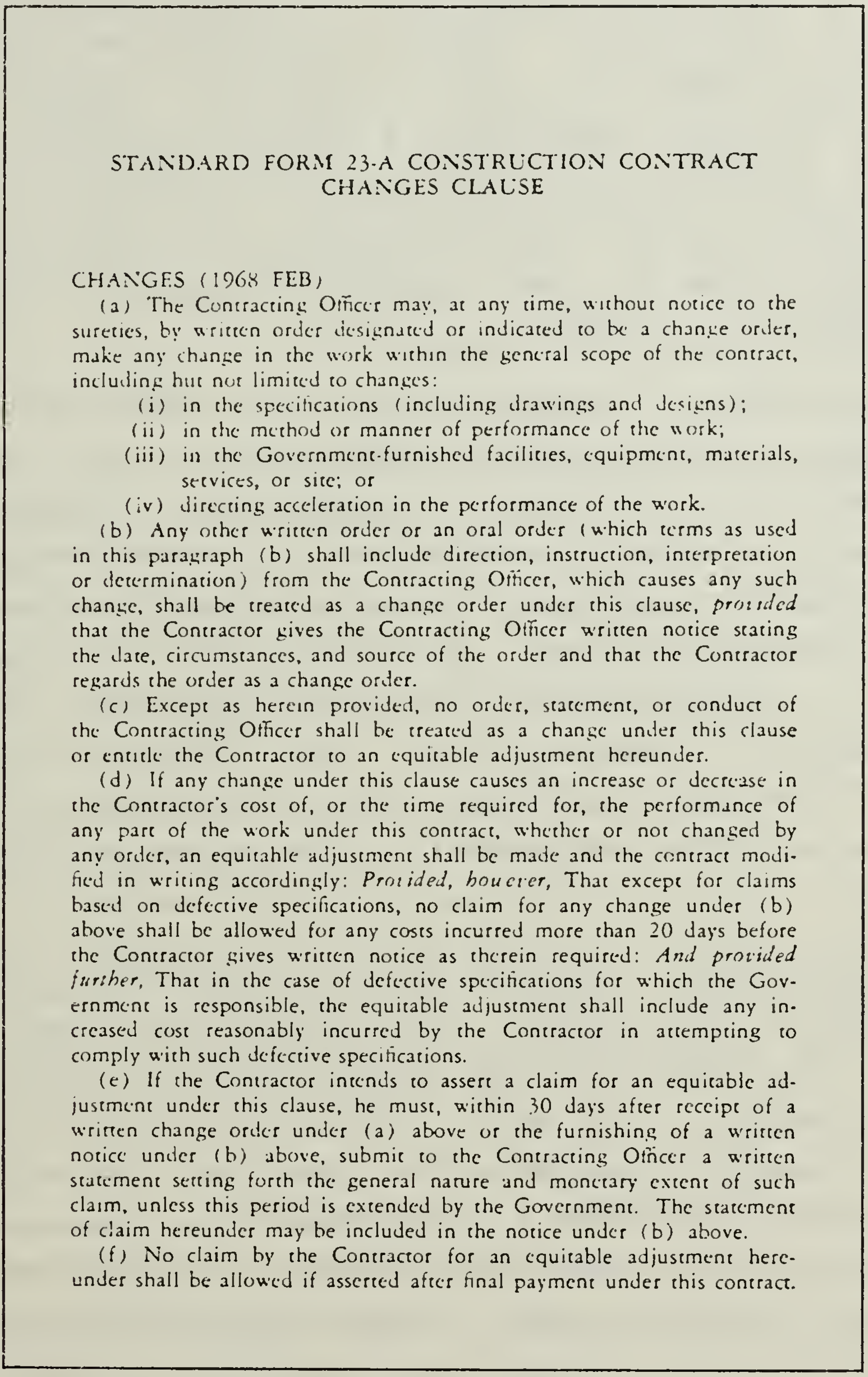
The "Changes" clause also serves a useful purpose in allowing contractors a means of initiating changes when errors in the drawings and specifications or special problems in site conditions are encountered. Some Government officials have been concerned that a contractor can utilize this clause as a vehicle for improving his position under a contract where a loss is being incurred either because of a substantial underbid or a variety of other reasons. The contractor is in a strong bargaining position knowing that there will be no price competition. [Ref. 6: pp. 38-39]

A "Changed Conditions" clause was originally incorporated into the Armed Services Procurement Regulation (ASPR)[4] to discourage construction contractors from

---

[3] A change order will be defined herein as a means of ordering variations, changes, and additions to the work under contract within the normal authority of the NAVFAC Engineering Field Division. Therefore Supplemental Agreements and change orders that, when added to existing change orders on a contract, exceed one hundred percent of the original contract price shall not be included. Field ROICC's are not authorized by NAVFAC to exceed this percentage.

[4] The ASPR, adopted in 1947, was replaced by the Defense



STANDARD FORM 23-A CONSTRUCTION CONTRACT CHANGES CLAUSE

CHANGES (1968 FEB)

(a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make any change in the work within the general scope of the contract, including but not limited to changes:

(i) in the specifications (including drawings and designs);
(ii) in the method or manner of performance of the work;
(iii) in the Government-furnished facilities, equipment, materials, services, or site; or
(iv) directing acceleration in the performance of the work.

(b) Any other written order or an oral order (which terms as used in this paragraph (b) shall include direction, instruction, interpretation or determination) from the Contracting Officer, which causes any such change, shall be treated as a change order under this clause, *provided* that the Contractor gives the Contracting Officer written notice stating the date, circumstances, and source of the order and that the Contractor regards the order as a change order.

(c) Except as herein provided, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment hereunder.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any order, an equitable adjustment shall be made and the contract modified in writing accordingly: *Provided, however,* That except for claims based on defective specifications, no claim for any change under (b) above shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as therein required: *And provided further,* That in the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with such defective specifications.

(e) If the Contractor intends to assert a claim for an equitable adjustment under this clause, he must, within 30 days after receipt of a written change order under (a) above or the furnishing of a written notice under (b) above, submit to the Contracting Officer a written statement setting forth the general nature and monetary extent of such claim, unless this period is extended by the Government. The statement of claim hereunder may be included in the notice under (b) above.

(f) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract.

Figure 2.1 Construction Contract Changes Clause.

including contingency allowances in bids for additional work possibly experienced in handling subsurface materials. It promised an equitable adjustment in contract price for additional work necessary to deal with unforeseen conditions. It could be employed only where both contractor and Government parties labor under a "mutual mistake of fact" concerning estimates or beliefs involved. Therefore, it was not the purpose of the Changed Conditions Clause to protect a contractor from his own errors of judgment or calculations. [Ref. 7: p. 19]

In 1968, a slightly revised clause was adopted dealing with "differing site conditions." This clause is incorporated into the General Provisions for Construction Contracts. In effect, this clause removes some risk from the Government by providing for an adjustment decreasing the price if the conditions are found to be better than expected. "Differing Site Conditions" replaced the former title "Changed Conditions" in the Standard Form 23-A (Contract Provisions for Construction Contracts) to describe more accurately the subject matter of the clause. [Ref. 8: p. 205]

There is no question that the "Changes" clause has been used for the purpose of improving the contractor's position. The Government has several ways to protect itself in this situation. The most common is to require adequate proof of claimed increased costs [Ref. 6: p. 39]. In general, the Government is insulated from contract price growth by explicit federal regulations binding contracting parties and policies that discourage excessive change orders.

Acquisiton Regulation (DAR), which has since been consolidated into and replaced by the Federal Acquisiton Regulation (FAR). The provisions for Changed Conditions, stated within, are still applicable as 10 U.S.C. 2301.

3. Change Order Rate

The change order rate is simply the percentage increase (or decrease) in contract price over the original award amount due to change orders. It is used specifically in this research to assess the impact of price changes irrespective of contract size. It has the advantage of placing all contracts under a normalized measure of performance. The corresponding disadvantage is that a given change order rate may have very different impacts on contracts of contrasting size. This raises the question whether the change order rate is a useful measure for assessing the performance of contract administration. For example, a ten percent increase in contract price for a small contract may be the result of one rather mundane change. A ten percent increase for a large contract, however, probably is the result of more complex problems for the contractor. The amount for these changes could involve complex construction methods that affect other portions of work, or the amount could be an accumulation of many minor changes. A number of small changes as opposed to a single larger one, has the tendency to spread disruptive effects throughout many phases of construction. This problem has been the subject of claims made by contractors for "impact" costs created by a "ripple effect," where a change disrupts the remainder of the contract work [Ref. 9: p. 46].

Keeping contract change orders within controlled minimums is one of NAVFAC's goals [Ref. 10: p. C-109]. Any realistic limit to change orders must be expressed as a goal, not an absolute. Many change orders are valid and prudent tools for accomplishing mission objectives. They are issued for various reasons, including correcting any errors or omissions in plans and specifications. They give the Government the flexibility to make convenient adjustments as a result of inevitable errors, oversights, and changes in conditions or requirements. Yet Government agencies have been accused of using change orders excessively [Ref. 11: p. 8]. Criticism has been focused on proper or sufficient actions by Government Contracting Officers to:

- Ensure the correctness of contract documents prior to the solicitation of the invitation for bids.
- Screen nonessential customer-requested change orders.
- Settle contract change order prices within reasonable amounts during negotiations with contractors [Ref. 2: pp. 9-14].

NAVFAC communicates specific management goals for its subordinate Engineering Field Divisions (EFD's) through annual Command Management Plans (CMP). In many cases, goals are specifically tailored for each EFD. Under the Fiscal Year 1984 Construction Program of the CMP, all EFD's are subject to the same criteria for change orders:

- Keep all construction type change orders within six (6) percent of their cumulative current year contract Work in Place[5] (WIP) while maintaining Military Construction change order activity at five (5) percent.
- Keep unforeseen conditions orders[6] within two percent of the cumulative current year construction contract WIP.
- Keep design change orders[7] within 1.5 percent of the cumulative current year construction contract WIP. [Ref. 10: p. C-109]

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[5] Work in Place refers to the dollar value of work considered to be constructed in place by a contractor. Progress payments are entitled to the contractor based upon the determination of this value by the ROICC.

[6] CMS-coded (see Chapter III.A.1) change orders caused as a result of underground obstructions, changed soil conditions, unobserved site conditions and misstated underground utility locations.

[7] Change orders coded for design errors and omissions.

Internal controls to stem the abuses criticized above are incorporated into NAVFAC directives. Preprocurement actions are carefully delineated in NAVFAC's Contracting Manual (P-68) to assure comprehensive review of contract documents prior to award. The negotiation of change order prices requires an independent Government estimate to be used as the basis for determining a reasonable settlement. Customer-requested change orders must be limited to "in scope" changes with the stipulation that "desirability of the change and the fact that funds may be available do not enter into determinations of scope" [Ref. 12: p. 7-3.1.]. Before the construction plans and specifications are disseminated to prospective contractors, there are three stages of design review. The first two stages are reviews by NAVFAC managers to insure that designs and specifications are adequate for the intended construction. The last of these is a customer review to ensure that a facility will meet the stated functional and mission requirements [Ref. 13: p. 6].

B. CONTRACTOR PERSPECTIVE

1. Bidding Strategy

Contractors, over the long run, are forced to bid low enough to win, yet high enough to cover cost and make a profit. Successful strategy then, as depicted in bid theory, is to bid at a rate above cost that will yield the greatest expected value, that is, the net of probability of winning multiplied by profit margin. As profit margins are increased, the probability of winning is decreased. As a contractor successively increments his profit margin in a bid, he increases the probability that he will exceed the bid of one of his competitors--and therefore lose the award. Presumably, an optimal profit margin exists where the corresponding probability of winning an award yields the greatest expected profit [Ref. 14: pp. 488-490].

The contractor's first prerequisite for making profits is to win a bid. In the short run, a contractor may be compelled to use a low bid strategy that virtually assures his chances of winning. The amount of his winning bid can seem quite illogical to other competitors. A common occurrence that has frustrated many contractors is that many of the bids submitted on all types of projects appear to be below reasonable costs. In one particular observance, nearly 80 percent of the bids on all major jobs were at less than the engineer's estimate,[8] some even at less than half the engineer's estimate [Ref. 15: p. 127]. In Government contracting, the mandatory independent estimate of project costs is an average cost only. In contrast, bids of rival firms on contracts represent opportunity costs for their resources. Each rival firm has the option to choose those contracts that are the most advantageous to them in terms of their special qualifications. These low bids are indicative of marginal costs. A Government estimate cannot be contractor specific, that is, representing the cost of performing a particular project or job for one specific firm [Ref. 16: p. 214].

It is advantageous for the contractor to consider the following in choosing a job so that he will have a likely chance of winning:

a. Size. Usually the larger the job, the fewer will be the number of competitors. This increases the probability of winning. Adversely, the larger the estimate, the greater the risk that the estimate will be inaccurate. Larger construction projects tend to involve more unconventional construction methods and have many interrelated activities. Estimators are more prone to errors and oversights in determining the costs for these methods or activities. Smaller jobs may be more attractive to contractors as they can be the foundation for invaluable contacts and reputation for later, more profitable eventualities--a form of advertising.

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[8] The independent estimate made by the architect-engineer as an agent of the owner. For Government contracting the parallel is the Government estimate.

b. Care and attention required. A smaller organization may be more successful in performing work on a job that requires more attention to detail than could be provided by a large, high-overhead company.

c. Profit advantage. Several jobs concentrated in one locality offer inherent advantages. Economies of scale can be realized for labor, materials, and supervision. Improved labor relations and productivity, price discounts for bulk purchases, and improved time-saving and coverage of supervision and management result.

d. Continuity of employment. Steady employees earn their pay more productively. Once the maximum yearly contribution to the Social Security tax (FICA) has been made by the contractor, the balance stays with the contractor as a distinct accrual to his job return.

e. Labor conditions. Jurisdictional disputes may involve a contractor's workforce and result in wage increases.

f. Subcontracting. The reaction and bid of the subcontractor can be important. If the contractor can be assured of obtaining low subbids from reliable subcontractors, he will have a good chance of getting profitable work.

g. Financial solvency. The competitive edge may be determined by the ability to finance construction between progress payments, procure construction and payment bonds, and take advantage of trade discounts for prompt payment.

h. Competition. The greater the number of competitors, the lower the contract price must be to win the award. A decrease in price below a certain point makes opportunities elsewhere more favorable. [Ref. 17: pp. 81-86]

i. Seasonal considerations. Some contractors disregard overhead and equipment costs and bid low upon reaching a certain volume of work during an operating year.

j. Desperation. When a contractor is in a financial position where money is urgently needed to pay bills, any source, including jobs at a loss, can prolong survival in business [Ref. 15: pp. 187-188]. When faced with a choice of giving up his capital to avoid going deeply into debt, a contractor will assume a great amount of risk just to stay in business. [Ref. 18: p. 154]

There is an intuitive reason to suspect that a winning bid is occasionally submitted by a poorly-informed, irresponsible bidder. The poorly-informed bidder cannot expect to make a positive profit since his bid must undercut an amount very close to the project's "true value" in order to win. The "true value" is a theoretical estimate of what the project should cost, after all biases for misjudgment of costs, unreasonable contingency amounts, and greed are removed. The poorly-informed bidder, in order to make any profit at all, must bid within a very narrow interval betweeen this "true value" and the maximum-informed bidder's amount. More likely, his winning bid will be below the "true value." This phenomenon is referred to as the "winner's curse;" the individual to whom a contract is awarded tends to be the one who most underestimated the true value of the work [Ref. 19: p. 133]. In higher-risk contracts, the Government might award the contract to a contractor of questionable financial stability, but who cannot be classed as irresponsible.[9] Reputable contractors would avoid such high-risk, lump-sum contracts, because they would expect to be underbid by contractors who fail to see risk or who desire such risk [Ref. 18: p. 154].

All contractors must face risk. Risk includes all exposures to loss brought about by nature, organizational shortcomings or outside influences. Some of these are: (1) weather, (2) unexpected job conditions, (3) personnel problems, (4) delays in material deliveries, (5) labor strikes, (6) faulty materials, (7) faulty workmanship, (8) operating problems (additional expenditures for increased supervision, damage to equipment through overloading or poor maintenance), and (9) natural disaster.

Successful bidding strategy would seem to involve a careful synergism between assumption of risk and assessment of competition. A misjudgment of the former is likely to result in a disasterous financial consequence. Misjudgment of the latter will likely result in loss of the award.

2. Measuring the Intensity of Competition

A sharp increase in construction industry unemployment occurred in the spring of 1980 (see Figure 2.2). The industry recession prompted contractors to be much more competitive as demonstrated by contractor practices in soliciting business on a national rather than strictly local scale, bidding on new types of work, and bidding more projects. Officers of several reputable firms lamented that in order to win, profit margins in bid estimates had to be cut between 25 and 50 percent. [Ref. 20: p. 70]

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[9] If considered a "responsible" bidder, a contractor is entitled to award provided he is also a responsive bidder.

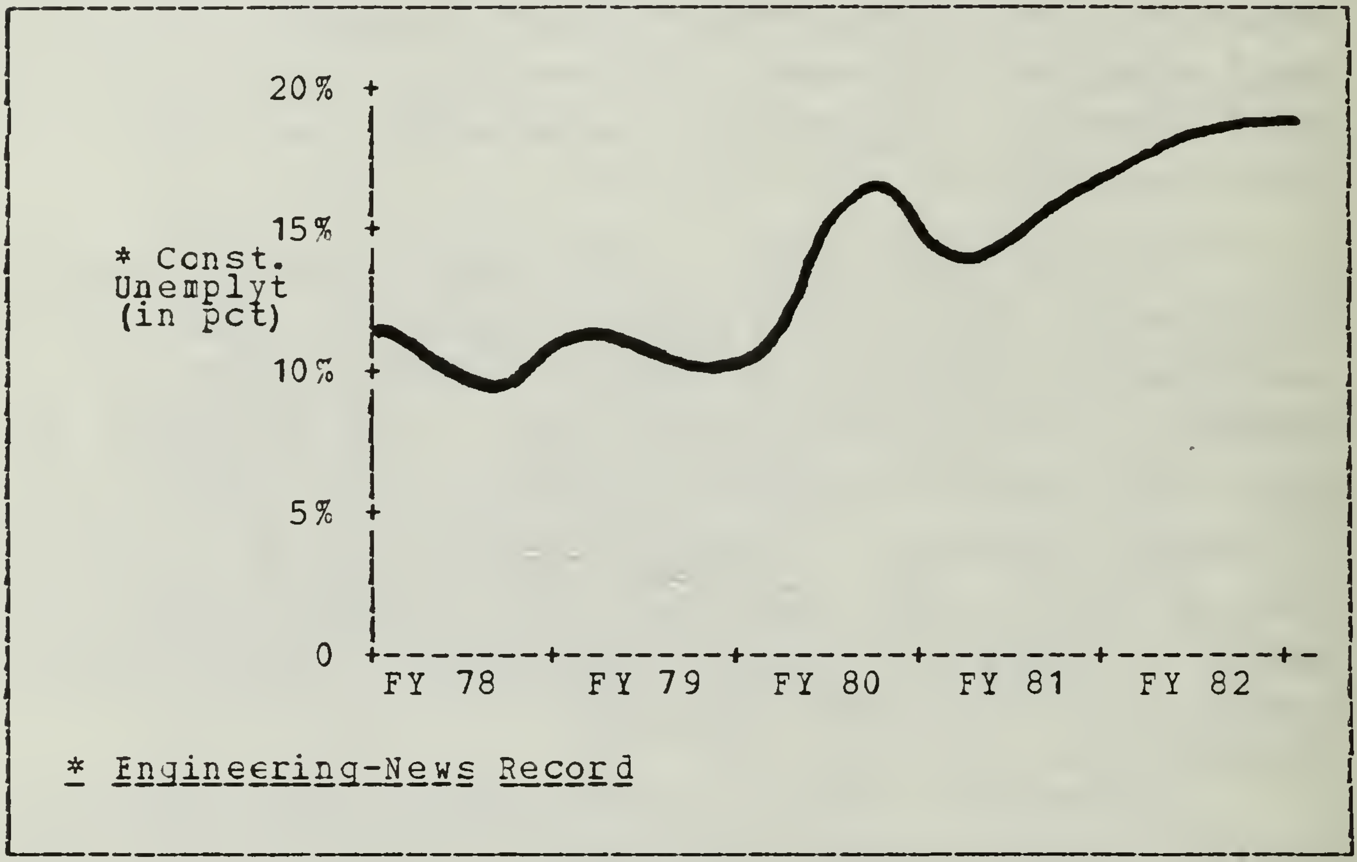

Figure 2.2 Construction Unemployment Fiscal Years 77-82.

The level of competition for a particular contract can be measured in at least three ways. First, the spread, or difference between the low bid and the second low bid, measures the amount of money "left on the table" and indicates how much higher the low bidder could have been and still taken the award. As the number of bidders increases, the percentage spread decreases [Ref. 21: p. 1382]. Second, the ratio of the winning bid to the Government estimate can be used. A ratio near one would indicate firms bidding near average costs while a lower ratio would indicate more competitive opportunity costs [Ref. 16: p. 214]. The third measure, the expected number of bidders, can be applied where it is necessary to decrement one's markup margin (in order to win) as more competitors respond to the invitation for bids [Ref. 16: p. 213].

The spread can be normalized for contracts of varying sizes by expressing it as a percentage of difference between the lowest and second lowest bids. The bid-to-Government estimate ratio is already normalized and the number of bidders does not appear to be significantly related to the size of a contract. [Ref. 16: p. 217]

An analysis conducted for a large general contractor illustrates that winning bids are based on opportunity costs. Over a two year period, 35 percent of all competitors' bids were below this contractor's estimated direct "out of pocket" costs of performing the work. This contractor was still able to compete successfully among other reputable firms, and his estimates closely reflected his actual costs of operation. Two-thirds of all bids submitted by his competitors fell between 91 and 120 percent of his direct job cost. To be assured a 50 percent probability of winning each award, the contractor would have had to bid below construction cost, or at a negative profit. [Ref. 15: pp. 127-128]

3. Contractor Dislikes for Change Orders

Many contractors contend that change orders are unprofitable [Ref. 22: p. 314]. They complain that they require great effort to price and then take considerable time to get approved and processed [Ref. 23: p. 8]. The implementation of changes results in a dilution of top supervision on original contract work. Too much time of key individuals is spent arranging for changes and pricing and negotiating them [Ref. 9: p. 46].

This sentiment may partially explain why complaints arise from the Government that change orders are priced too highly by contractors. The contractor attempts to account for unknown costs which he fears may occur, while Government estimators may have an unrealistic understanding of actual costs involved in certain operations, particularly the low productivity of direct labor as a result of changes, delays, and uncertainties [Ref. 9: p. 47]. Those contractors averse to change orders should be logically in favor of contracts that limit the amount of damages entitled to the contractor, some contract administrators argue [Ref. 24: pp. 97-98]. If the Government is lenient in permitting compensation to contractors for disputed matters where liability is questionable, then disreputable contractors will benefit. The disreputable contractor, who relies on these compensations, will underbid honest contractors. Limitation of liability clauses in a contract would stem the practice of bidding low and seeking to recoup losses at a later date [Ref. 24: pp.97-98].

The additional financial burden of performing change orders may be unaffordable to the contractor who is in a low cash position. The contractor also must deal frequently with "constructive"[10] change orders, which are informal but have the effect of eroding profits. A contractor may incur losses on a contract unknowingly, suspecting that there are deficiencies in his accounting system. The real problem may be unidentified constructive change orders [Ref. 25: pp. 5-6].

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[10] An oral or written act or omission by the Contracting Officer or other authorized Government official which is of such a nature that it is construed or inferred to have the same effect as a formal written change order under the "Changes" clause.

4. Contractor Preferences for Change Orders

Since the Government reserves the right to issue "in-scope" changes to the provisions of a contract, the contractor is within his rights to demand equitable adjustments for additional costs anticipated in associated extra work. If a change reduces the amount of work under contract, the Government, too, is usually entitled to consideration through a reduction of contract price. U. S. Navy contracts ordinarily permit a limit of six percent profit for changes negotiated pursuant to the "Changes" clause [Ref. 12: p. 7.3.4]. The claim that Government estimators of change order prices have been too reliant upon contractor estimates during negotiations [Ref. 11: p. 28], raises the question whether this profit limit has been frequently circumvented. Furthermore, the profit that might have been realized through these changes may have been of sufficient amount to improve many contractors' faltering financial positions.

The practice of trying to obtain a contract award by knowingly offering a price less than anticipated costs, with the expectation of increasing the price during performance through change orders, is referred to as "buying in." This is generally deemed to be irrational bidding behavior for contractors, except for large, multibillion-dollar firms that depend upon traditional growth in defense "state of the art" programs [Ref. 1: p. 106]. But "buying in" may not seem so irrational if viewed as a two-part strategy. Behind the low bid could be a "bail-out," or contingent escape strategy. A "bailout" is a loophole which allows the bidder to recoup losses. The "bail-out" can even be perpetrated with the help of the Government by accepting whatever the contractor can deliver, even if it is a cheaper or substandard product. After all, it is reasoned, the public disclosure that a very low bid has been accepted could be ultimately embarrassing to Government officials. Either a deductive change order or termination of contract, which would have the effect of minimizing the contractor's losses, could be a satisfactory compromise for both parties [Ref. 26: pp. 84-87].

C. THE QUEST FOR PROFIT THROUGH CHANGE ORDERS

The potential to profit from any change order depends upon many factors. Among the most prominent of these is the type of change order. The Defense Audit Service, in a 1982 audit [Ref. 11: p. 8], attributed 73 percent of DOD change orders to three causes. Slightly over half of the change orders they found were due to deficiencies in designs and specifications; ten percent resulted because specifications and designs had not been completed before the basic contracts were awarded; and about eleven percent of the change orders were the result of user requests for changes. Value engineering changes were not cited as a significant cause of change orders, but they are very attractive for enhancing contractor profitability.

1. Customer Requests

It is difficult to predict customer-requested change orders since they are implemented either in response to unpredicted changes in mission requirements, or in as a result of inadequate planning. They can be generated as a real facility need or as a compromise or exchange for facility features no longer required. It has been an implicit policy of NAVFAC to accomodate the customer's desires for such changes [Ref. 11: p. 19]. If the contractor is bound by a set of explicit specifications and drawings, the customer-requested change order may be one of the final avenues for opportunity profits. An indicator of contractor motive here would be seen by suggestions for changes made by the contractor directly to the facility user.

2. Ambiguities of Contract Documents

The most overt evidence of contractor motive to benefit through change orders has been seen in the litigation of disputes over contract documents. Considerable legal precedent in establishing the conditions through which a contractor may benefit from contract ambiguities has evolved in the courts. A number of landmark cases clearly shows that both Government and contractor parties cannot use unilateral interpretations of contract language to benefit at the expense of each other. Since the majority of change orders are caused by mistakes in the preparation of contract documents, this is the most fertile ground for seeking extra compensation. Ordinarily the contractor relies on the implied suitability of Government plans and specifications for their intended use [Ref. 27: p. 1076]. But a contractor's interpretation of contract language may differ from that of the Government's due to some degree of ambiguity caused by imperfect wording, conflicting statements or depictions, or connotated meanings. The legal system has tested many cases involving contract ambiguities and has, as a result, produced two counterbalancing, risk allocation principles: the rule of contra proferentum, which adopts the interpretation that favors the non-drafting party (contractor) and the rule of pre-contract clarification, which denies adoption of a contractor's interpretation when he has failed to request clarification of an ambiguity of which he knew or should have known [Ref. 27: pp. 993-994].

a. Legal Precedent Favoring the Contractor

Courts have generally been sympathetic to contractors when inaccurate or incomplete information in bid packages result in unexpected costs. In Peter Kiewit Sons' Company v. United States, 109 Ct. Cl. 390 (1947), the Court of Claims held:

> Where one of the parties to a contract draws the document and uses therein language which is susceptible of more than one meaning, and the intention of the parties does not otherwise appear, that meaning will be given the document which is more favorable to the party who did not draw it. This rule is especially applicable to Government contracts when the contractor has nothing to say as to its provisions. [Ref. 6: pp. 231-232]

In WPC Enterprises, Inc. v. United States, 163 Ct. Cl. 1, 323 F.2d 874 (1963), and Blount Brothers Construction Co. v. United States, 171 Ct. Cl. 478, 346 F.2d 962 (1965), the Courts ruled that where an ambiguity was "subtle, not blatant" and where the contractor is genuinely misled and not deliberately seeking to profit from a recognized error by the Government, relief is entitled to the non-drafter [Ref. 28: p. 152]. Furthermore, in Gholson, Byars and Holmes Construction Co. v. United States, 173 Ct. Cl. 374, 351 F.2d 987 (1965), the Court ruled that there is no duty to seek clarification where a contractor innocently construes a subtle ambiguity in his favor. Equally important, if clarification is not provided to an ambiguity sought by a contractor, the Government will be held to have waived its right to complain of the interpretation placed on the contract by the contractor [Ref. 29: pp. 154-155].

Under the rule of pre-contract clarification, the contractor is obligated to inquire about major patent discrepancies, obvious omissions or drastic conflict in provisions. In a case where the distinction between a patent and latent ambiguity was an issue, the Board of Contract Appeals in Worsham Construction Co., Inc., v. United States, GSBCA 5469, refused the Government invocation of the "patent ambiguity" rule as a means of preventing contractor recovery for a defective specification. [Ref. 30: pp. 9-10]

b. Legal Precedent Favoring the Government

The rule of pre-contract clarification is a rule of fair dealing which protects the Government from a contractor who intentionally submits a low bid with the goal of claiming ambiguities during contract performance to obtain price increases. In Beacon Construction Co. v. United States, 161 Ct. Cl. 1, 314 F.2d 501 (1963), the contractor failed to notify the Government of an ambiguity and interpreted the contract in its own favor. The contractor sought to recover expenses after performing the work where the contract language was vague. The Court denied relief to the contractor, holding that such a claim was made without protest and in absence of direction from the Government [Ref. 6: p. 234]. Where a conflict in contract documents exists and is known to the contractor, relief will be denied the contractor when he assumes the right to disregard the affected portions and apply his own remedy. The Court stated in S.O.G. of Arkansas v. United States, 212 Ct. Cl. 125, 19 G.C. (1976), that this action is taken to avoid post-award disputes of the type which arose here by encouraging contractors to seek clarification before anyone is legally bound [Ref. 31: pp. 3-4].

The pre-contract clarification rule also applies to circumstances where a reasonable or experienced bidder should be capable of recognizing a patent or glaring discrepancy. In Wickham Contracting Co. v. United States, 212 Ct. Cl. 318, 546 F.2d 395 (1976), a contractor submitted a bid based on an erroneous drawing scale. The court ruled that the use of the erroneous scale was so unusual that it created a patent discrepancy [Ref. 27: pp. 1074-1078]. Similiarly, in J. W. Bateson Co., Inc. v. United States, GSBCA 1221; R. M. Hollingshead Corp. v. United States, 124 Ct. Cl. 681, 683, 111 F. Supp. 285, 286 (1953); and others, the Courts generally agreed that:

> An experienced contractor cannot rely on government-prepared specifications where, on the basis of the government furnished data, he knows or should have known that the prepared specifications could not produce the desired result for '. . . he has no right to make a useless thing and charge the customer for it.' [Ref. 27: p. 1079]

c. Misrepresentation

A contractor might receive relief or avoid the commitment to a contract if he is misled by a false representation or nondisclosure of terms in the bidding package. Although such action is usually not indicative of a contractor's motive to gain through changes to a contract, it provides recourse for a low bidder to escape an unprofitable dilemma. A Contracting Officer must be careful that he is not on constructive notice of an error where a mistake in bid is alleged after award of contract. If a low bid is significantly lower than other competing bids or the Government estimate, the contractor may avoid commitment to the terms of the contract ordinarily established under the firm bid rule[11] if he can demonstrate that the Contracting

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[11] Under the firm bid rule in Government contracting, the bidder cannot, in the absence of special circumstances, withdraw or revise a bid at the time of bid opening.

Officer had "constructive knowledge" of a mistaken bid. [Ref. 32: pp. 152-153]

3. Value Engineering

Value Engineering changes are unique in that they tend to maintain the essential function of a facility while creating cost savings for both the Government and the contractor. Provided that a facility's "essential function" is retained intact, a Value Engineering change will deflate the change order rate and increase contractor profitability. In fixed-price NAVFAC contracts, the contractor's share of savings is determined by subtracting Government costs (resulting from developing and implementing the change) from contract savings and multiplying the result by 55 percent. The Value Engineering provision is applicable to contract prices of $100,000 or more [Ref. 33]. Obviously it is an attractive alternative to consider for the change-minded contractor.

D. GENERAL HYPOTHESIS

It has been stated that contractors are compelled in competitive situations to bid very close to their expected costs of construction. They are motivated in some cases to win as a preferable alternative to having no business at all, even if it means operating at a loss. Winners of competitively-bid contracts are either those who enjoy the relative advantages of economies of scale or proprietary properties, or are willing risk-takers. Risk-takers are those who accept the probability of setbacks in the course of construction. More likely they probably believe that they can recoup profits later. Although there are many reasons that a prudent contractor would chose to avoid change orders, they are nonetheless inevitable. It is the premise of this paper that there is a link between the cost of change orders to a contract and the degree of competitiveness under which that contract was bid. As bidding competition increases, those bidders who are more amenable to the risk of seemingly unprofitable ventures and are willing to gamble on change order dynamics displace the more conservative and reputable contractors.

The contractor can use a number of different change order types to his benefit. Among these are customer-requested changes, changes to correct mistakes and ambiguities in contract documents, changes to account for differing site conditions, and Value Engineering changes. Value Engineering changes have been shown to be a relatively small proportion of federal construction contract administration effort. If these contractors as described are typically successful bidders, then higher change order rates among contracts that are bid under strong competitive conditions should be systematically evident. Empirical data will be used in a model to test the following conclusions:

- A direct relationship exists between change order rate and degree of competition--measured by number of bidders, the "spread," bid/Government estimate ratio, bid/mean bid ratio, and deviation of winning bid from mean bid.

- Relationships exist among various classifications of construction contract change order rates according to: (1) timing of the contract award, (2) contract size, (3) geographical area, (4) type of facility, and (5) construction industry unemployment rate.

III. METHODOLOGY

A. DEVELOPING THE DATABASE

1. General

The data for the research were collected at the Western Division, Naval Facilities Engineering Command, San Bruno, California (WESTDIV). Only construction contracts that were formally-advertised and fixed-price are included for analysis. These contracts were WESTDIV administered--that is, advertised and awarded through WESTDIV or its authorized agents at WESTDIV-designated geographical locations. Therefore, construction contracts awarded by local Officers-in-Charge of Construction (OICC's) of more limited contracting authority at 20 remote "field" offices are not included.[12] The data were extracted from two sources:

- The Construction Management System (CMS), a subsystem contained in the AMALGAMAN/Integrated Disbursing and Accounting Data Base Master maintained by the Naval Facilities Support Office (FACSO). The information provided was extracted from the CMS system for the author. The data were transcribed from computer printouts into the statistical computer program to be used for the analysis in this chapter.

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[12] Navy Civil Engineer Corps officers assigned as Public Works Officers at Naval activities usually are assigned concurrently (dual authorities are vested in one person) as field OICC's. As a field OICC, contracting authority is more limited than that of the Commander of the Engineering Field Division (WESTDIV). Since field OICC contract bidding data are maintained locally at these remote offices and their collection was considered infeasible within the time constraint for research, they are excluded from analysis.

- Completed Scales of Bid Offers for Construction Contracts (12ND WESTDIV Form 4330/24) maintained by the Head, New Procurement Branch (Code 021) of the Acquisition Department. This information was provided by hardcopy listings of individual contract Government estimate and bid-opening results.

2. Data Set Definition

The model for analysis is established within the following considerations:

- Availability of bidding information.
- Recentness of information.
- Consistency in management policies concerning contract administration.
- Completion (closeout) of contract.
- U.S. Navy funding sources (appropriated and non-appropriated) only.

The major restriction for data analysis is imposed by availability of bidding information. Although CMS affords the opportunity to review award amounts and change order information for contracts of all appropriation sources and Engineering Field Divisions of NAVFAC, the extraction of information for bidding data and government estimates[13] is cumbersome. Accordingly, only WESTDIV contracts awarded from Fiscal Year 1978 to the present have been included.[14] This does afford relative currency of information. Fiscal Year 1983 data is excluded, however, due to (1) the small proportion of completed contracts available and (2) revision of WESTDIV policies in (a) "downloading" many contracts to field OICC's (WESTDIV was authorized increases in manpower levels for field offices, so many contracts, especially OMN-funded, were delegated in 1983 to OICC's to administer), (b) accelerating the execution of WESTDIV contracts award phase and (c) encouraging other forms of modifications to contracts, such as Supplemental Agreements. Items (b) and (c) above were internalized in Fiscal Year 1983 WESTDIV management objective plans.

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[13] Government estimates for contracts are available in another subsystem of the AMALGAMAN Data Base, but they are not tailored as necessary to reflect the actual estimate for the base bid plus or minus the additive or deductive bid items that actually might have been awarded.

[14] Scales of Bid Offers are maintained at WESTDIV for six years until disposal. Coincidentally, data for completed contracts were implemented into CMS at the approximate starting point for this same period (1977).

All considered contracts must have been "closed out" or completed, so that the change order rate is reflected as a final, static figure, rather than a dynamic one as under a contract-in-progress. This constraint is imposed so that all influences of contract price expansion during the life cycle of the contracts have matured.

Funding sources are limited to Military Construction, Navy (MCON) and Non-Appropriated Funds (NAF) contracts in excess of $200,000, and Operations and Maintenance, Navy (OMN) contracts in excess of $2500. This constraint is arbitrary. The intent is to view the incidence of construction change orders under one service branch (Navy), so that as much consistency in the attitudes and policies of making change orders could be ensured. This would avoid any possible biases by NAVFAC managers. The $200,000 floor on MCON and NAF contracts reduces the size of this study's data base to a workable[15] number and eliminates many mixed-funding source contracts.[16] These contracts represent a relatively small proportion of the total amount of MCCN and OMN funds administered by NAVFAC and therefore should not significantly bias the results of analysis.

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[15] Initially it was estimated that inclusion of many smaller MCON contracts would overload the storage capacity of the MINITAB computing system used for statistical analysis.

[16] Many construction contracts are funded by a mix of more than one source-- for example, MCON and OMN dollars are commonly used under one contract for building alterations

3. Refining the Data

The data considered within the above constraints possess a number of clear outliers that, if included in the analysis, would distort overall values for change order pricing and bid averages. The following types of WESTDIV contracts are further excluded:

- Contracts terminated early, where the majority of construction dollars are not consumed or "in place." Otherwise the change order rate would appear as a large deductive (negative) one. A small number of contracts are terminated for convenience of the Government if the facility or some of its features are no longer required. A contract may also be terminated for default when the contractor fails to make satisfactory progress in construction or breaches the terms of the contract.
- Contracts for which costs listed in CMS do not account for the majority of the award amount. Presumably, other phases of construction had not yet been reported as completed or consisted of work funded under a separate, unreported source.
- Construction contracts for Adak, Alaska, under WESTDIV's cognizance; these contracts suffer from restrictive competition and unique logistics at an isolated location.

A total of 473 completed MCON, NAF, and OMN construction contracts awarded from October 1977 through September 1982 were listed on the CMS printouts as of 15

(MCON) and repairs (OMN) when the construction features for each funding source are clearly separated.

February 1984. Of these 47 were deleted for the reasons stated above. Another 126 contracts for Fiscal Years 1980 and 1981 were excluded because their corresponding Scales of Bids were not available. There remained 300 contracts for analysis. Table I summarizes the distribution of these contracts.

TABLE I

Summary of Distribution for Database Contracts

FISCAL YEAR	NUMBER OF CONTRACTS			TOTAL DOLLAR AMT (in $1000)			YEAR TOTAL (in $1000)
	OMN	MCON	NAF	OMN	MCON	NAF	
1978	6	43	4	$ 868	72111	2453	$ 75432
1979	28	76	6	6295	142980	5008	154283
1980	14	14	2	5741	31817	688	38246
1981	1	12	2	255	17645	569	18469
1982	60	28	4	14932	30279	1713	46924
TOTAL	109	173	18	28091	294832	10431	$ 333354

4. Summarization and Assumptions

Appendix A describes the variables provided for each WESTDIV contract by the Construction Management System and the Scales of Bids. Appendix B tabulates these data.

a. Assumptions

(1) Geographical Categorization.. To isolate the effects of geographical differences in climate, economy, employment rate, and other factors, the contracts are classified among eight general categories. Four of these pertain to major U. S. Naval activity concentrations, while the other four are classified as "rural" areas in the outlying vicinity of these concentrations. Generally these "rural" activities lie more than 50 miles or convenient commuting distance from San Diego, Los Angeles, San Francisco or Seattle/Bremerton.

(2) Number of Bids. It is apparent that some bids appearing on the Scales of Bids were disproportionately high as compared to either other competitors or the Government estimate. These bids would only distort values (such as standard deviation and mean bid) calculated for analysis [Ref. 21: pp. 1377-1378]. These are considered nonserious or "noise" bids and are typically excluded in studies of auctions and bidding models [Ref. 19: p. 126]. An appropriate algorithm for identifying these bids depends upon the model, and there appears to be no definite rule for determining them. Therefore, any bid greater than 150 percent of the competitive mean bid was arbitrarily considered a "noise" bid by the author and was extracted. This adjustment was made to 54 bids on 43 contracts. It was observed that some bidders consistently submitted "noise" bids. Common reasons for unreasonably high bid prices may fall into one or more of the following categories [Ref. 34: p. 127] :

- Complementary bidding. The bidder is not interested in performing the subject work, yet does not want to be otherwise prevented from bidding on future projects or to be deleted from future Bidder's Lists. The proposed price is inflated to a range that will prevent likely award.

- Bidder error. Mistakes simply may be made when calculating bid prices.
- Bidder misunderstanding of the scope of the work.
- Perceived risk on the part of the bidder. Any number of factors may cause the bidder to perceive real or imaginary areas of risk and to raise his bid price to provide for this risk.
- The bidder may be quite uncertain about the proposed work, the Government's particular requirements of the contractor, or his ability to perform as expected.

(3) Next Lowest Bidder's Price and Spread. The next lowest bidder's price and the spread are included for analysis to examine any significant relationships between change order rate and intensity of competition. Chapter II.B.2. cites the significance of these data in bid analysis.

(4) The Number of Change Orders. The number per contract of dollar-valued change orders is analyzed to determine the effect it has on the change order rate. Some change orders are "no-cost" and do not directly affect the change order rate. Among the dollar-valued change orders are amounts either added to, or deducted from, the contract price. This variable is of no value for predictive purposes, it is noted, since it cannot be known at the time of bid opening.

(5) Low Bid/Mean Bid Deviation. The deviation of the low bid from the mean bid can be expressed as a measure of the number of standard deviations that lie between the low bid and mean bid on a given contract. It conveniently normalizes all contracts regardless of award amount. A comparatively high value here is an indication of

an unusually deviant bid. But the value of a standard deviation is diminished for very small population sizes, so this measure is used only on contracts where there were at least four bidders. Analysis is focused on the determination of any relationships between this value and the change order rate.

(6) "Equivalent" Change Order Rate. A contract change order is frequently intended as a means of correcting a deficiency or mistake or making an "in scope" change that is more accomodating to the facility user. Frequently, a specific feature of a final facility after change orders is not that which was originally intended at the award of contract. In many cases, some facility features are no longer needed or are substituted by an equivalent "in-scope" alternative. These changes do not alter the function of the facility, but they do alter the contract price, and usually at a lower cost. Adding the amount of deductive change orders back into the contract price reflects more accurately what the contract would have cost if the original features were left intact. While this is not necessarily an accurate assumption for all deductive change order situations, it is believed to provide a more conservative comparison of contracts in the context of "dollar's worth" of construction. Value engineering change orders are not added back into the contract price, because this kind of change order actually reduces the contract price without "impairing essential functions or characteristics." The basic criterion for deducting the "equivalent" change order, as contrasted with leaving the Value Engineering change order intact, is in the consideration given to the Government. In the "equivalent" change order, the Government gets a reduction in the contract price, because it is buying something less in value than originally intended.

(7) Winning Bid to Average Bid Ratio. This value, usually less than unity (unless there is only one bidder), compares the relative difference between the winning bid and the competitive average. The "competitive average" excludes the winning bid in its computation and is assumed to be a more realistic approximation of a construction project's "true" or market price. Therefore, a low ratio would imply that a winning bid is priced far below expected costs, and is prone to being a "buy-in" or a potentially losing venture for the contractor.

(8) Winning Bid to Government Estimate Ratio. The use of this ratio for analysis assumes that the independent Government estimate, also referred to as the "engineer's estimate," is a fair price for the contract. The relationship of change order rates to this ratio is another focus of analysis.

b. Research Limitations

The availability of Scales of Bids and a source for reliable Government estimates is clearly the most limiting factor of this research. A reliable classification code for the type of construction performed under each contract was extremely limited. It is acknowledged that certain types of construction, such as placement of underground utilities, are inherently risky. Many projects involve an aggregation of various construction trade disciplines, so it is difficult to make a single, inclusive classification for a contract. NAVFAC Facility Category Codes [Ref. 35] are available in CMS for Military Construction contracts only. However, Facility Category Codes categorize contracts according to facility type rather than construction type. Table II summarizes the distribution of Military Construction contracts contained in the database according to Category Code.

TABLE II

MCON Contracts by Category Code

Facility Category	Number of Contracts
Operational (excl. Waterfront)	21
Waterfront	10
Training	19
Maintenance	33
Production	1
Supply	12
Hospital, Medical and Dental	7
Administration	8
Unaccompanied Personnel Housing	9
Community	3
Utilities and Ground Improvements	43
Total Military Construction Contracts in Database	173

c. Other Data

For informational purposes, Figures 2.2 and 3.1 show the trends in various measures of construction industry inflation and unemployment over Fiscal Years 1977 to 1982. This information is extracted from periodical issues of Engineering-News Record (ENR).

(1) Construction Industry Inflation. Figure 3.1 plots ENR's Construction Cost Index (CCI) for three major geographical areas pertinent to the database contracts. The CCI is a measure of the combined effect of wage and material price changes on the value of the construction dollar. The year 1967 was established as the base for an index value of 100. This index is computed monthly by ENR for twenty major U.S. metropolitan areas.

(2) Unemployment Rate. This rate is determined quarterly by ENR and is expressed as a national average; no geographical distinctions are made.

(3) Small Business Set-Asides. NAVFAC requires that all construction procurement in excess of $2500 and under $1,000,000 shall be considered for Small Business Administration (SBA) set-asides [Ref. 12: p. 4.2.13]. A small business set-aside is a procurement that is eligible only for award to an SBA-certified contractor. Set-asides were created to encourage more commerce among small, entreprenurial firms. Approximately 95 percent of the database contracts are set-asides. The awarding of set-asides has drawn some concern:

> A dilemma to the Government posed by set-asides is that in the short run, prices may be higher and competition restricted as small businesses incur high start-up costs and are unable to take advantage of economies of scale to lessen costs. In the long run, however, the set-aside program enlarges the total number of contractors available to compete, and it should thereby contribute to lower contract bids. [Ref. 37: p. 21]

B. ANALYTICAL COMPUTATIONS

The data were compiled for analysis on the IBM 3033AP Computer at the Naval Postgraduate School, Monterey, California. The general purpose statistical computing system, Minitab [Ref. 36], was used to perform various computational functions for data organization and analysis. The functions included:

- Sorting, rank-ordering, and recoding of data.
- Mathematical calculations (averages, totals, standard deviations, etc.).
- Histogram and plot construction.
- Regression analysis.
- Analysis of variance.

1. Sorting, Rank-ordering, and Recoding of Data

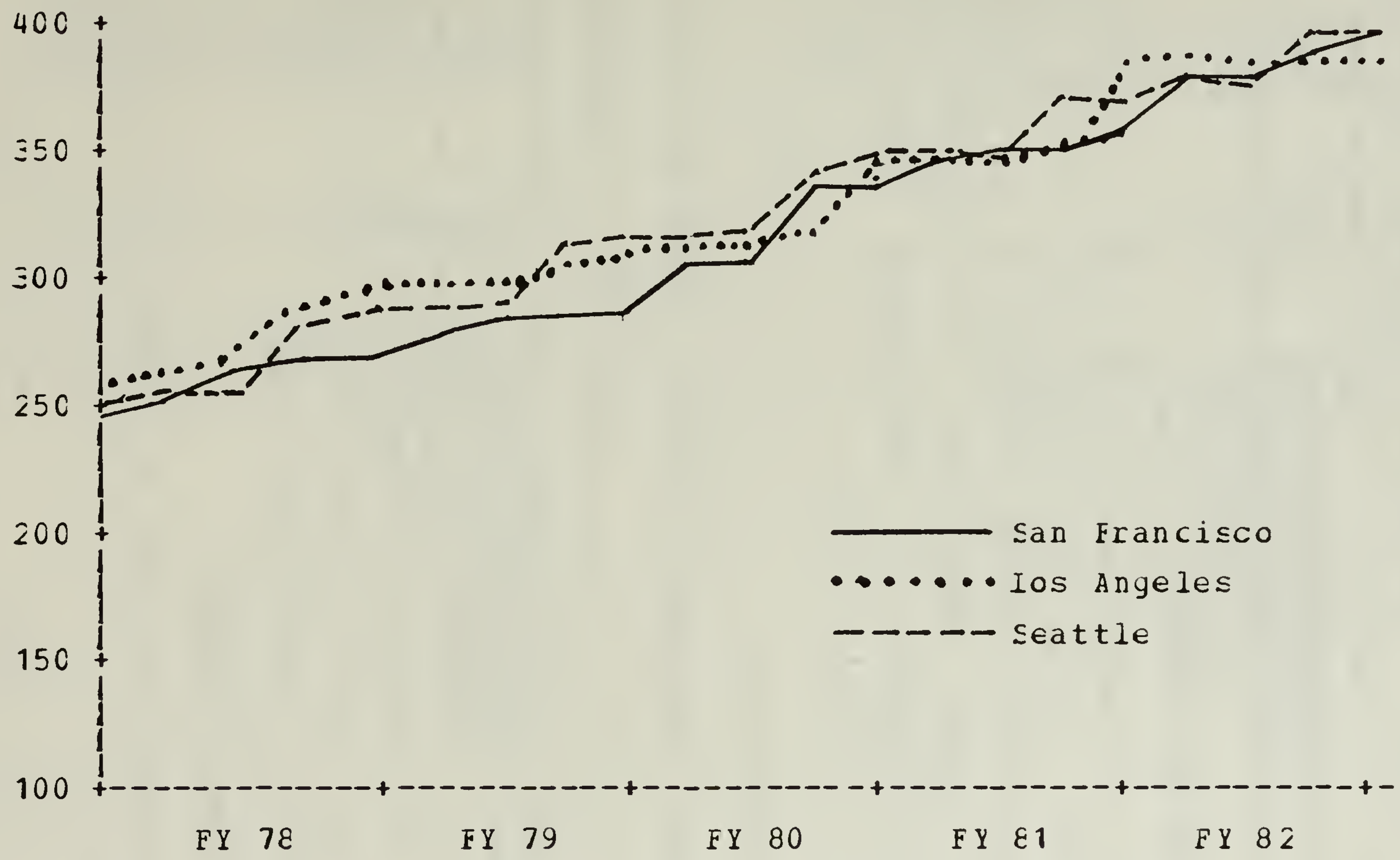
These features of Minitab are useful in examining ranges of values, breaking data into cells for variance analysis, and isolating selected independent variables for more detailed analysis. Variance and regression analyses can be performed conveniently for selected geographical areas, time frames, dollar ranges, facility types, and many other desired classifications.

2. Mathematical Calculations

Minitab enables simple calculations of averages, totals and standard deviations of various data diversifications. Much of the summary data represented in this study are the result of these calculations.

3. Histogram and Plot Construction

This feature provides convenient display of data distributions. Figure 3.2 displays the skewed distributions of change order rates for the database contracts. Plots afford graphical displays of of relationships among variables. They are used, if necessary, in analysis of regression residuals to check the validity of the assumptions of normality and constant variance of the residuals. Plots are useful in visually displaying the degree of correlation between two variables.



* Construction Cost Indexes (CCI) from Engineering-News Record

Figure 3.1 Construction Industry Inflation, Fiscal Years 1977-1982.

4. Regression Analysis

Regression analysis is a useful tool for determining relationships between a dependent variable and any number of independent variables. The change order rate, as a dependent variable, is examined for any significant relationship to a number of independent variables, such as number of bidders, the "spread," and bid-to-Government estimate ratio.

5. Analysis of Variance

Through the use of analysis of variance, significant differences among two or more populations of data can be tested. A statistical investigation can be made into the comparison of change order rates, for example, among different classifications of geographical areas, award periods, and bid-estimate ratios.

C. FINDINGS OF ANALYSIS

1. Dependent Variables

The objective of this analysis is to determine any significant relationships through regression and variance analyses between change order rates and other variables available in the database. Two independent variables are considered: the actual change order rate and the "equivalent" change order rate--a refined figure with the dampening effect of deductive change orders removed.

2. Independent Variables

The following are used as independent variables for regression analysis:

- Number of Change Orders.
- Number of Bids.

```
Actual Change Order Rate
Each * represents 2 observations

Middle of     Number of
Interval      Observations

  0.00 minus 2     *
 -2.00       7     ****
  0.0       70     ***********************************
  2.00      43     **********************
  4.00      40     ********************
  6.00      34     *****************
  8.00      24     ************
 10.00      16     ********
 12.00      14     *******
 14.00       8     ****
 16.00       3     **
 18.00       4     **
 20.00       6     ***
 22.00       5     ***
 24.00       3     **
 26.00       4     **
 28.00       4     **
 30.00       0
 32.00       2     *
 34.00       1     *
 36.00       3     **
 38.00       1     *
 40.00 plus  5     ***
-------------------------------------------------------

Equivalent Change Order Rate
Each * represents 2 observations

Middle of     Number of
Interval      Observations

-2.00 minus 1     *
 0.00      72     ************************************
 2.00      42     *********************
 4.00      40     ********************
 6.00      35     ******************
 8.00      24     ************
10.00      18     *********
12.00      14     *******
14.00       8     ****
16.00       3     **
18.00       4     **
20.00       5     ***
22.00       6     ***
24.00       4     **
26.00       3     **
28.00       6     ***
30.00       1     *
32.00       2     *
34.00       1     *
36.00       3     **
38.00       1     *
40.00 plus  7     ****
```

Figure 3.2 Histograms of Change Order Rates.

- Number of Standard Deviations Between the Low Bid and the Mean Bid.
- Winning Bid to Mean Bid Ratio.
- Winning Bid to Government Estimate Ratio.
- Percent Spread Between the Low Bid and the Next Lowest Bid.

Subpopulations of the following variables were used for examining significant differences among change order rates through variance analysis:

- Award Date Periods, by fiscal year and by fiscal quarter.
- Award Amount, in stepped ranges of various dollar amount intervals.
- Geographical Area, by each of the eight categories, and then into two categories--"metropolitan" versus "rural."
- Funding source, in three cells--Military Construction, Non-appropriated Funds, and Operations and Maintenance.
- Number of Bids, in various cells ranging from one to 24 bids per contract.
- Winning Bid to Mean Bid Ratio, classified into 10 cells of approximate equal size:

0.00 - 0.70
0.70 - 0.78
0.78 - 0.82
0.82 - 0.85
0.85 - 0.88
0.88 - 0.91
0.91 - 0.93
0.93 - 0.95
0.95 - 0.97
0.97 - 1.00.

- Winning Bid to Government Estimate Ratio, classified into ten cells for all 300 contracts; and seven cells for the 173 MCON contracts:

300 Contracts	173 MCON Contracts
0.00 - 0.65	0.00 - 0.80
0.65 - 0.76	0.80 - 0.90
0.76 - 0.84	0.90 - 0.97
0.84 - 0.90	0.97 - 1.03
0.90 - 0.97	1.03 - 1.10
0.97 - 1.03	1.10 - 1.20
1.03 - 1.10	1.20 plus.
1.10 - 1.19	
1.19 - 1.30	
1.30 plus	

- Unemployment Rate, classified into 13 cells representing approximate construction industry unemployment rates ranging from 9.0 to 18.5 percent over 20 quarters.

3. Preliminary Findings

a. Change Order Rates

The change order rates for the data are shown in Table III. These rates are higher than the WESTDIV standards of six percent overall and five percent for Military Construction contracts. The WESTDIV standards are predicated upon the annual Work in Place, however, and do not account necessarily for all change orders to a given contract. The figures above are representative of a slightly different criterion, that is, the total change orders for each contract, including settlements to claims that may have lingered over a substantial period of the contract life. WESTDIV has been more successful in controlling the overall change order rate than it has the MCON change order rate. The Command Management Plan standards mentioned in Chapter II are high. The change order rates in Table III, it is recalled, were adjusted to eliminate deviant values. To make a more fair comparison between the performances of CMP-based change order rates and the change

TABLE III

Change Order Rate Summary

Average Change Order Rate	Actual (percent)	Equivalent (percent)
MCON	7.83	8.43
OMN	7.53	8.41
NAF	6.19	6.23
OVERALL	7.62	8.29

order rates determined in this analysis, a number of factors would have to be considered in order to put them on an even plane. Such factors include the percentage of Work in Place contracts actually completed, and the average incidence rate of change orders toward the end of the contract life.

b. Number of Bids Affecting the "Spread"

Park [Ref. 15] asserts that the percentage spread decreases as the number of bidders increases. The evidence for this in this analysis is weak. The only significant[17] difference in the spread is between the group of 3 to 5 bidders and the group of 6 or more bidders. The mean spread for the group of 3 to 5 bidders in the data is 13.2 percent, with a confidence interval between 10.1 and 16.3 percent. The mean "spread" for the group of 6 or more bidders is6.9 percent, with a confidence interval between 4.4 and 9.4 percent. These findings are based on only 169 contract observations, as the "spread" was not calculated for contracts where there were three bidders or less.

4. Findings of Regression Analysis

A series of stepwise regressions were performed on each of the dependent variables against all considered independent variables. No single variable emerged with a correlation that was significant enough to explain the change order rate. The measure of the proportion of total variation in a dependent variable that is explained by a regression line is the coefficient of determination, or "r-squared" value.[18] Each of the independent variables alone failed to yield a coefficient above 6.0 percent. The best fit found was a multiple regression of the bid-to-Government estimate ratio and the number of change orders against the actual change order rate. Only an 8.2 percent coefficient existed here with "t" ratios[19] for the bid-to-Government estimate and number of change orders equal to -4.64 and 2.87 respectively. Since the values of the coefficients of determination are so close to zero, the change order rate explained by the independent variables is insignificant.

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[17] Based on a 95 percent confidence level.

[18] The coefficient of determination or "r-squared" value can range from zero, which denotes no correlation, to unity, which represents perfect correlation.

Subpopulations of geographical areas, funding sources and time frames failed to isolate any further data that could provide useful regressions. Plots of change order rates against each of the independent variables indicated that little resemblance of a linear relationship existed in any case. Figure 3.3, the plot of actual change order rate versus bid-to-Government estimate ratio, demonstrates this point.

5. Findings of Variance Analysis

In all analyses of variance, 95 percent confidence intervals for level means were assumed in hypothesis testing. One-way analyses of variance were performed for each of the two independent variables (actual and "equivalent" change order rates).

a. Award Date Periods

Two analyses of variance were performed: (1) by fiscal year and (2) by fiscal year quarter. If improvements have resulted in controlling change order rates due to WESTDIV efforts, then significant differences in change order rates should lie among the the five fiscal years. At least a significant difference between 1978 and 1982 should

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[19] A "t" ratio should be at least plus or minus 2 to be considered significant enough for an independent variable to used in a regression equation.

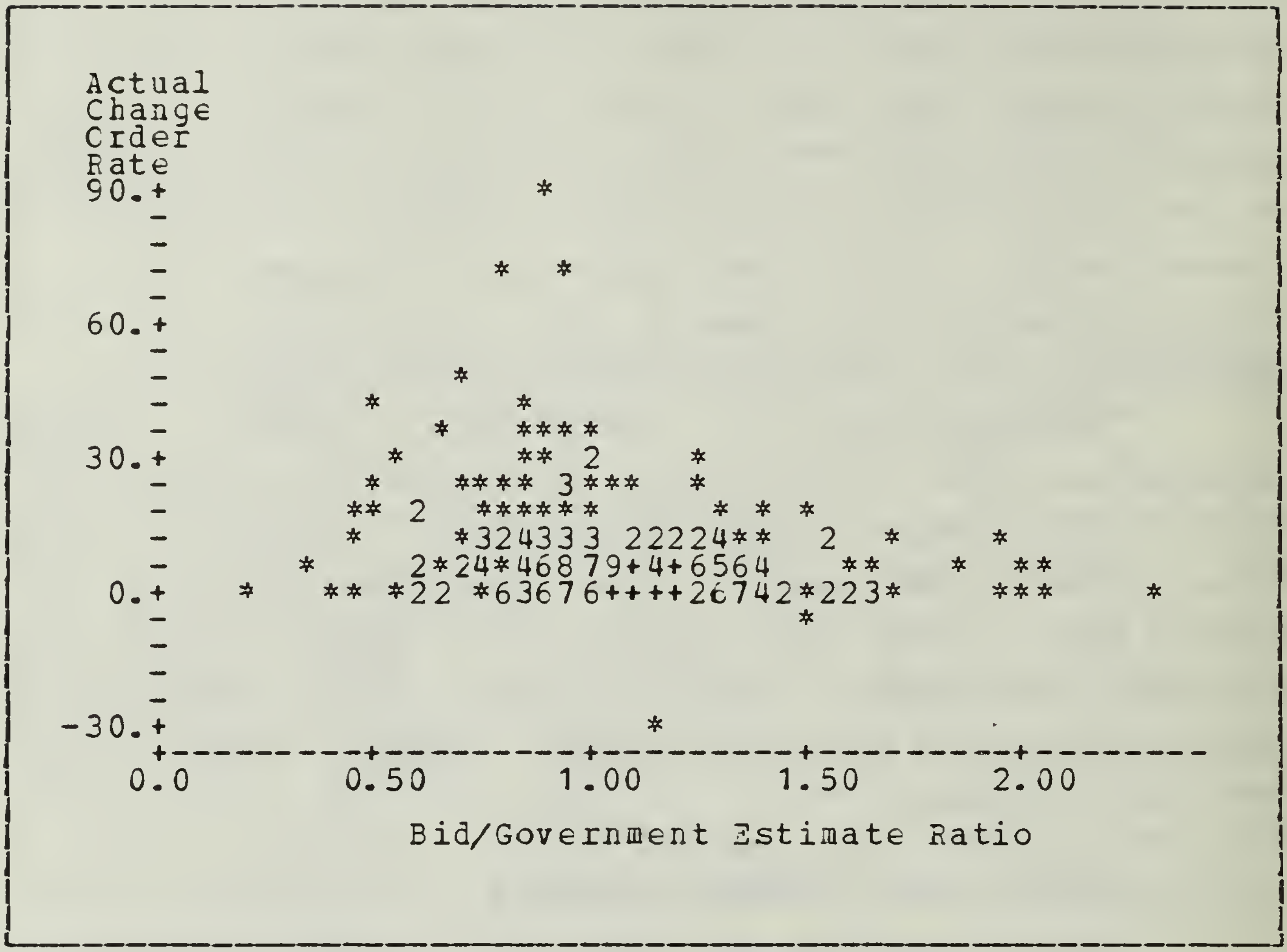

Figure 3.3 Plot of Change Order Rate vs. Bid/Govt Est.

exist. The hypothesis is that there has been significant improvement in reducing change order rates, and that it will be demonstrated by a change order rate confidence interval for 1982 that is below the lower limit of the confidence interval for 1978.

There is a common perception that contracts awarded in the fourth quarter tend to be "rushed" in the attempt to award before the end of the fiscal year and that the quality of specifications and drawings is therefore sacrificed. If this true, then a significantly higher change order rate should be seen for awards made during the fourth quarter in contrast to the other quarters. This hypothesis will be affirmed if the lower limit of the fourth quarter change order rate confidence interval is greater than the upper confidence interval limits of the other quarters.

Analysis of variance for both cases reveals that no significant differences in change order rates can be found between any of the fiscal years or fiscal year quarters. Therefore, no improvement in reducing the WESTDIV change order rate over the five years was observed. Although there was no statistical difference in the change order rates among the four quarters, it was interesting to note that the mean change order rate (both actual and "equivalent") for contracts awarded during the fourth quarter was the lowest.

b. Other Findings

Analyses of variance for amounts of award, funding sources, number of bids, winning bid-to-mean bid ratios, Category Codes, and unemployment levels revealed no significant differences in change order rates among the various cells.

c. Geographical Areas

Among the eight described geographical areas there were no significant differences in change order rates between any two areas. An analysis of variance clearly shows that there is a significant difference in the change order rate between construction contracts performed in "rural" areas and those performed in the "metropolitan" or high density areas. Rural areas incur lower change order rates than do metropolitan areas. Figure 3.4 shows the 95 percent confidence intervals for each of these two cells. The upper limit of 7.1 percent for actual change order rate (based on a pooled standard deviation) for rural areas is exceeded by the metropolitan areas' lower limit of 7.3 percent.

```
(Based on Pooled Standard Deviation)
  +-------+-------+-------+-------+-------+-------
Metropolitan                    I*******I*******I
Rural **********I*************I
  +-------+-------+-------+-------+-------+-------
  2.0     3.5     5.0     6.5     8.0     9.5    11.0

              Actual Change Order Rate


(Based on Pooled Standard Deviation)
  +--------+--------+--------+--------+--------+-------
Metropolitan                         I*********I*******
Rural *************I***************I
  +--------+--------+--------+--------+--------+-------
 2.5      4.0      5.5      7.0      8.5      10.0

             Equivalent Change Order Rate

    Based on 214 "Metro" and 86 "Rural" Contracts
```

Figure 3.4 Variance Analysis for Geographical Areas.

d. Winning Bid to Government Estimate Ratio

The most significant findings in the difference among change order rates are found in the varying ranges of this ratio. Generally, it is found that change order rates tend to be high when the winning bid is proportionately lower than the Government estimate. Conversely, change order rates are significantly lower where the winning bid is much greater than or very close to the Government estimate. Figure 3.5 shows the 95 percent confidence intervals for change order rates among the cell classifications described

```
(Based on Pooled Standard Deviation)
--+---------+---------+---------+---------+---------+-
Bid/Govt Est Range
0.00-0.65                        I********I*********I
0.65-0.76                        I**********I********I
0.76-0.84                             I*********I*****
0.84-0.90                   I********I********I
0.90-0.97       I**********I**********I
0.97-1.03    I*********I********I
1.03-1.1 I*********I*********I
1.1-1.19         I*********I********I
1.19-1.3      I*********I********I
1.3-INF    I*********I*********I
  +---------+---------+---------+---------+---------+-
-4.0       0.0       4.0       8.0      12.0      16.0

              Actual Change Order Rate

(Based on pooled Standard Deviation)
           -+---------+---------+---------+---------+-
Bid/Govt Est Range
0.0 - 0.65                        I*********I*********
0.65 - 0.76                       I**********I********
0.76 - 0.84                           I*********I*****
0.84 - 0.90                 I*********I*********I
0.90 - 0.97     I**********I************I
0.97 - 1.03  I*********I*********I
1.03 - 1.10     I*********I************I
1.1 - 1.19          I**********I**********I
1.19 - 1.3    I*********I*********I
1.3 - INF   I*********I**********I
           -+---------+---------+---------+---------+-
           0.0       4.0       8.0      12.0      16.0

                   Equivalent Change Order Rate
```

Figure 3.5 Variance Analysis for Bid/Govt Estimate.

in Section C.2. of this chapter. There is a significant difference in change order rates for both the actual and "equivalent" change order rate between the ratio extremes. The difference is significant between contracts where the ratio is 84 percent and lower; and where the ratio is either 119 percent and higher or between 97 and 103 percent. Where the ratio is roughly between 3 and 16 percent on either side of the Government estimate, no significant difference (at a 95 percent confidence level) in change order rates can be detected. One reason explaining why change order rates are significantly low where the winning bid is within three percent of the Government estimate could be that these are considered "clean," risk-free jobs, and the work and costs involved are clearly discernable by both the Government and the contractor estimators.

This ratio may be of some use to the Contracting Officer in assessing the level of competition for a contract. If a contractor's bid is significantly lower than the Government estimate (approximately 15 percent), the likelihood of high change order rates can be anticipated.

D. SUMMARY OF ANALYSIS

A database with recent construction contract information was developed so that the principles introduced in Chapter II could be challenged for validity. It was necessary to make a number of refinements to the data so that various external influences such as nonserious bids, peculiar geographical characteristics, and terminated contracts that distort any general trends in change order rates could be eliminated.

A general statistical program, Minitab, was used to calculate a number of analytical determinations. Chapter II introduced the notion of competition intensity as a variable that affects the profit margin that contractors apply to bids. It is a general hypothesis of this thesis that as competition intensity increases, winning bidders tend to be contractors who are willing to assume greater risks than their rivals. They apply lean profit margins to their bids and expect change orders to ultimately improve their financial positions. The measures of competition intensity introduced in Chapter II, in addition to two measures introduced by the author, are applied in the database analysis to determine what conclusions can be drawn. Finally, the incidence of change orders among varying classifications of geographical areas, time periods, price ranges, and unemployment rates was examined.

IV. SUMMARY AND CONCLUSIONS

A. SUMMARY

The excessive use of change orders in Government contracting has been alleged to be the result of improper diligence and care by management. The change order, in its original conception, was intended to be a remedy for the imperfections of contract language and depictions so that Government and contractor parties could proceed in executing the contract to a smooth end. Although change orders are intended primarily as a convenience for the Government so that "in-scope" modifications can be made to contract drawings and specifications, there is some evidence that the contractor has used change orders to his advantage. The intensity under which construction contracts are bid creates a highly competitive environment that demands a careful trade-off between a rational profit margin and a competitive price in order to win and stay in business.

It has been suggested that the winners of competitively-bid contracts are frequently contractors who fall into several categories: (1) they enjoy the advantage of economies of scale over their rivals, (2) they are more willing to assume certain risks, and (3) they see the opportunity to improve their financial positions, once the objective of winning the bid has been attained, by recouping losses through change orders. The limits that govern the extent to which contractors and contracting officers can use contract language to resolve issues of contract ambiguities in their favor have been defined through legal precedent.

Some of the theories and concepts of bidding strategy were applied to a model of representative construction contract data to test for their validities. Chapter II introduced three conventional measures for intensity of competition that were applied in the analyses. Risk-takers and "buy-in" bidders presumably emerge as victors in the bidding game under conditions of intense competition. For this reason, the number of bidders on a contract, the spread between low bidder and next lowest bidder, and the bid-to-Government estimate ratio were used in regression and variance analyses to determine the validity of this statement. Two other measures were introduced by the author for use in analysis: the bid-to-mean bid ratio and the number of standard deviations of the low bidder from the mean bid. Chapter III considered a number of predictive variables that might help to explain the conditions that affect change order rates.

It was necessary in the analysis to make several assumptions and refinements to the data. This was done so that the data could be analyzed without the influence of outliers to distort any general trends.

B. CONCLUSIONS

Change orders do not appear to be influenced by any dominant variable or combination of variables. There are many miscellaneous factors, apparently randomly distributed throughout the contract administration process, that contribute to contract price growth. These factors include, but are not limited to:

- Contracting officer and contractor expertise and competence.
- Availability of construction materials and labor.
- Architect-engineer competency.

- Contractor business windfalls or failures on other concurrent jobs.
- Backlog of contracting officer paperwork.

The results of analysis were conclusive. No direct relationship exists between the change order rate and any simple combination of variables. The most significant findings for the variables that were considered lie in the change order rates among varying bid-to-Government estimate ratios and geographical locations. Change order rates appear to be higher when the contractor bid is at least 15 percent below the Government estimate. When the contractor bid is very close (within three percent) to the Government estimate, or when his bid is approximately twenty percent above the Government estimate, change order rates are significantly lower. This information may be useful to the contracting officer in anticipating the magnitude of change orders for a contract, since it is information readily available at bid opening.

There is a significantly lower change order rate for construction contracts awarded for "rural" Naval activities than there is for contracts awarded in metropolitan areas, such as San Diego, Los Angeles, San Francisco, and Seattle/Bremerton. The explanation for this is speculative, but one may infer that "rural" contracts are "cleaner" or that the intense bidding competition in the metropolitan areas contributes to higher change order rates.

A discovery incident to the aim of this thesis was that the change order rate was remarkably similiar to the spread. Of the 169 contracts with 4 or more bidders, the actual change order rate mean was 7.91 percent with a standard deviation of 12.10. The mean spread was 9.36 percent with a standard deviation of 13.06. These figures imply that statistically, for a 95 percent confidence level, there is no significant difference between the two.

C. FUTURE RESEARCH

The intent of this thesis was to identify variables that significantly influence change order rates. Data was therefore refined so that general trends could be examined. One obvious shortcoming in the analyses was in the consideration given for the type (structural, electrical, mechanical, earthwork, etc.) of construction and the effect it has on the change order rate. Future research could explore this variable for significant relationships in change order occurrences.

There is room for more study on the performance of goal standards established in the NAVFAC Command Management Plan for controlling change orders. Research could not only determine how well the Engineering Field Divisions are performing under these standards, but it could identify where weaknesses exist. Such factors as geographical location, construction type, or type of facility may be selectively examined.

The analysis of bid spreads could determine when a justifiable move should be taken to cancel and rebid for contracts or when it is feasible to remain with a low bidder even if other forms of contracting (for example, negotiated fixed-price) seem desirable.

APPENDIX A

DESCRIPTION OF DATABASE VARIABLES

DATA GROUP 1

Column 1 CONTRACT NUMBER	The number assigned by WESTDIV prior to the Invitation forBids (6-digit number), identifying the contract.
Column 2 AWARD DATE	The date the contract was awarded by WESTDIV to the contractor. (Year-Month-Day)
Column 3 AWARD AMOUNT	The amount of money originally awarded for a particular portion of work identified by line item in the CMS.
Column 4 GEOGRAPHY CODE	The location of construction, derived from the Unit Identification Codes listed for each contract in the CMS: 10 Metropolitan San Francisco area. 11 Northern California/Nevada area, excl. San Francisco metropolitan area. 20 Metropolitan Seattle/Bremerton area. 21 Washington/Oregon area excluding Seattle/Bremerton. 30 Metropolitan Los Angeles area . 31 Rural Los Angeles area, incl. Ventura County. 40 Metropolitan San Diego area. 41 Rural San Diego area, including Arizona.
Column 5 NUMBER OF BIDS	The number of responsive and serious bids submitted by contractors in response to the Invitation for Bids.

Column 6 MEAN BID	The average amount bid for each contract, equal to: $\frac{\text{Sum of bid amounts per contract}}{\text{Number of bids per contract}}$
Column 7 NUMBER OF CHANGE ORDERS	The number of dollar-valued change orders to a contract.

DATA GROUP 2

Column 1 GOVERNMENT ESTIMATE	The independent estimate of construction made by the Government for work corresponding to the base bid and bid additives actually awarded.
Column 2 WINNING BID	The winning bid for the contract by the contractor, inclusive of all work segments and funding sources.
Column 3 WINNING BID TO MEAN BID RATIO	The ratio of the winning bid to the mean of bids for a contract. Values close to unity indicate relative closeness of the winning bid to the competition average.
Column 4 WINNING BID TO GOVERNMENT ESTIMATE RATIO	The ratio of the winning bid to the Government Estimate. Values above unity indicate a winning bid that exceeds the Government Estimate.
Column 5 ACTUAL CHANGE ORDER RATE	The actual change order rate accounting for both additive and deductive change orders, expressed as a percentage: $\left(\frac{\text{Final contract price}}{\text{Original award amount}} - 1\right) \text{X } 100$
Column 6 "EQUIVALENT" CHANGE ORDER RATE	The change order rate adjusted to dilute the effect of deductive change orders, and to account for the difference in the final product from the original, equal to: $\left(\frac{(\text{FCP} - \text{DCO's} + \text{VECO's})}{(\text{Original award amount})} - 1\right) \text{X } 100$ FCP = Final contract price DCO's = Deductive change orders VECO's = Value Engineering change orders

DATA GROUP 3

Column 1 CONTRACT NUMBER	The number assigned by WESTDIV. (This number can be used as a cross-reference for data in the first two Data Groups.)
Column 2 SECOND LOWEST BID	The amount submitted by the second lowest bidder for the contract.
Column 3 NUMBER OF STANDARD DEVIATIONS OF LOW BID FROM THE MEAN	The number of standard deviations that the low bid for a contract lies from the mean of bids for that contract, expressed as: $\frac{\text{(Mean bid - winning bid)}}{\text{Standard deviation of bids}}$
Column 4 BID SPREAD	The percentage of spread between the winning bid and the second lowest bidder, expressed as: $\left(\frac{\text{Second lowest bid}}{\text{Winning bid}} - 1\right) \text{X} \; 100$
Columns 5 and 6 ACTUAL CHANGE ORDER RATE and "EQUIVALENT" CHANGE ORDER RATE	(As described in DATA GROUP 1)

APPENDIX B

WESTDIV CONSTRUCTION CONTRACTS DATA

Note: The following data are in three groups. The first two groups include data for all 300 contracts; the third group includes only those contracts with four or more bidders. The row number can be used as a cross-reference between the first two groups, and the Contract Number can be used as the cross-reference between the third group and the first two groups. For the first two groups, rows 1 through 173 are MCON contracts, 174 through 191 are NAF contracts, and 192 through 300 are OMN contracts. For the third group, 1 though 98 are MCON contracts, 99 through 110 are NAF contracts and rows 111 through 169 are OMN contracts.

DATA GROUP 1

Row	Contract Number	Award Date	Award Amount	Geog. Code	No. Bids	Mean Bid	No. C.O.
1	76-7344	77-10-28	708,297	21	5	780,542	6
2	76-7340	77-10-31	216,689	20	3	259,254	2
3	77-2067	77-11-03	389,225	20	3	478,195	13
4	76-7180	77-11-30	224,942	40	5	266,348	4
5	77-2276	77-12-01	367,000	31	6	460,632	2
6	76-7409	77-12-06	3,469,300	31	2	3,499,650	17
7	73-5370	77-12-06	3,379,000	20	2	4,271,000	11
8	77-2369	77-12-06	325,800	10	3	354,557	8
9	77-2454	77-12-09	269,000	40	3	297,333	1
10	76-7178	77-12-30	461,000	41	9	615,088	7
11	75-6305	77-12-30	6,555,000	31	8	7,001,945	12
12	77-2617	78-01-13	314,725	40	2	326,763	1
13	76-7336	78-01-19	4,711,868	10	3	4,958,533	37
14	76-7162	78-01-25	3,416,226	10	6	3,669,262	29
15	78-0224	78-02-06	345,430	10	2	351,185	3
16	77-2222	78-02-22	335,278	11	4	383,516	2
17	76-7150	78-02-28	5,982,800	40	6	6,175,274	27
18	77-2971	78-03-08	297,671	20	4	347,193	1
19	75-6468	78-03-15	4,031,967	10	5	5,377,916	23

20	71-4364	78-03-17	468,444	40	3	527,888	2
21	76-7236	78-03-31	1,599,998	40	4	1,768,336	15
22	76-7328	78-03-31	605,000	30	5	690,734	5
23	77-2674	78-04-21	249,168	31	7	327,332	3
24	77-2313	78-04-28	534,250	30	2	617,075	2
25	77-2657	78-05-01	294,744	40	6	311,050	3
26	77-2678	78-05-03	319,024	40	9	350,970	8
27	78-0455	78-05-26	333,600	31	7	392,684	5
28	77-2738	78-06-02	228,006	10	5	306,969	1
29	77-2570	78-06-15	282,100	40	4	343,478	6
30	77-2216	78-06-23	3,766,708	30	3	4,494,452	8
31	78-0243	78-06-28	905,294	40	5	959,918	17
32	75-6547	78-06-30	2,631,601	10	5	2,945,954	9
33	78-0539	78-08-02	334,307	40	4	357,297	3
34	77-2431	78-08-04	11,337,969	10	5	14,620,959	24
35	78-0601	78-08-16	359,994	40	3	371,455	3
36	78-0173	78-09-11	231,300	41	2	297,650	1
37	77-2073	78-09-15	1,411,600	10	7	1,682,800	10
38	77-2043	78-09-22	1,079,600	40	3	1,092,742	10
39	77-2877	78-09-26	2,684,591	40	2	2,808,796	29
40	76-7299	78-09-29	4,889,817	41	4	5,009,594	17
41	77-2057	78-09-29	1,096,500	31	10	1,317,934	6
42	77-2740	78-09-29	310,000	20	3	698,601	4
43	78-0638	78-09-29	355,999	40	6	384,766	7
44	78-0284	78-10-23	205,410	31	4	216,708	4
45	77-2533	78-11-14	758,218	31	6	891,798	9
46	77-2750	78-11-24	325,584	40	4	358,446	9
47	77-2554	78-11-29	358,000	30	2	363,950	3
48	77-2288	78-11-29	263,815	30	3	279,772	2
49	77-2132	78-11-30	4,258,400	41	3	4,456,133	15
50	78-0081	78-11-30	661,371	21	3	752,618	0
51	77-2269	78-12-05	1,728,062	40	7	1,834,278	8
52	77-2136	78-12-05	6,250,000	40	3	6,478,667	49
53	77-2053	78-12-15	3,179,662	40	2	3,288,181	46
54	77-2166	78-12-21	3,041,620	40	2	3,044,760	7
55	78-0389	78-12-22	214,100	31	1	214,100	1
56	78-0093	78-12-29	288,000	40	5	403,276	0
57	78-0502	78-12-29	664,000	20	4	762,226	6
58	75-6475	78-12-29	725,222	10	5	763,720	8
59	78-0870	79-01-03	333,000	31	3	349,861	1
60	78-0423	79-01-15	257,120	30	5	324,506	2
61	77-2819	79-01-18	492,530	40	2	518,265	5
62	76-7204	79-01-19	457,000	30	4	492,091	10
63	76-7142	79-01-24	1,696,000	31	4	1,816,150	17
64	74-3952	79-01-31	652,000	10	9	770,155	4
65	76-7022	79-02-07	495,850	31	3	553,390	2
66	75-6315	79-02-08	7,464,444	40	7	8,808,290	26
67	76-7164	79-02-15	529,619	10	3	547,480	3

68	77-2164	79-02-22	6,928,000	30	5	7,462,021	25
69	77-2170	79-02-23	7,690,000	10	6	8,027,333	53
70	78-0355	79-02-23	1,544,859	11	2	1,585,668	4
71	77-2889	79-02-28	859,900	40	4	882,174	5
72	77-2285	79-02-28	4,397,000	40	7	5,278,503	13
73	77-2051	79-02-28	5,454,059	40	6	5,938,593	44
74	78-0240	79-03-09	375,464	30	3	428,821	1
75	77-2174	79-03-14	8,833,000	21	8	9,875,402	23
76	78-0118	79-03-14	408,085	40	3	424,553	4
77	78-0880	79-03-16	452,405	31	4	511,109	2
78	75-6350	79-03-22	2,216,000	41	3	2,198,618	9
79	77-2909	79-03-28	2,489,572	10	10	2,987,846	22
80	77-2563	79-03-30	5,158,000	40	6	5,347,504	40
81	79-5279	79-04-19	672,969	40	4	735,434	7
82	77-2120	79-05-09	913,000	30	1	913,000	4
83	77-2520	79-05-10	979,926	30	6	1,037,688	7
84	78-0895	79-05-10	4,785,000	20	4	4,978,000	14
85	78-0698	79-05-11	274,840	10	6	289,345	2
86	79-5147	79-05-11	471,404	40	2	472,202	0
87	79-5048	79-05-14	989,343	40	2	1,094,609	6
88	78-0210	79-05-15	353,535	10	3	384,177	1
89	79-5251	79-05-16	2,669,810	31	5	2,798,030	6
90	78-0544	79-05-24	10,788,800	10	5	11,271,760	27
91	77-2996	79-05-25	6,882,000	31	6	7,258,031	8
92	79-5247	79-05-31	910,464	40	11	1,370,428	20
93	79-5364	79-05-31	261,206	31	2	330,103	2
94	79-5149	79-06-11	746,089	40	7	805,863	0
95	77-2787	79-06-15	567,000	10	10	625,812	6
96	78-0630	79-06-22	247,200	10	3	306,605	4
97	79-5289	79-06-29	3,229,500	31	3	3,426,215	19
98	77-2596	79-06-29	626,000	20	2	718,900	4
99	78-0220	79-06-29	238,238	20	3	258,213	0
100	78-0585	79-07-05	223,900	31	2	333,950	2
101	79-5286	79-07-13	439,000	41	1	439,000	0
102	79-5203	79-07-15	5,821,729	30	1	5,821,729	11
103	79-5287	79-07-31	1,423,000	41	7	1,849,179	2
104	79-5288	79-07-31	1,744,000	41	4	1,981,206	1
105	78-0575	79-07-31	706,184	41	3	753,728	5
106	78-0576	79-07-31	1,632,614	41	6	1,966,797	6
107	76-7131	79-08-02	888,111	30	4	1,030,105	9
108	78-0089	79-08-21	559,569	31	4	694,795	2
109	79-5499	79-08-24	430,408	11	3	444,326	6
110	76-7346	79-08-30	525,000	41	3	543,705	0
111	78-0265	79-09-13	225,128	40	7	250,798	5
112	78-0762	79-09-14	394,456	20	3	453,652	3
113	76-7160	79-09-15	2,605,000	10	5	2,746,821	14
114	75-6679	79-09-15	2,908,672	40	9	3,322,478	38
115	79-5099	79-09-17	1,179,971	30	6	1,322,904	10

116	79-5570	79-09-20	270,660	20	2	349,544	4
117	79-5400	79-09-20	284,000	31	2	305,788	1
118	77-2061	79-09-27	1,135,381	30	5	1,176,215	2
119	79-5165	79-09-28	871,673	30	4	1,351,965	4
120	78-0894	79-10-19	268,208	40	3	332,243	12
121	77-2959	79-12-06	3,176,693	31	2	3,433,347	6
122	79-5588	79-12-14	339,700	10	4	379,030	6
123	77-2126	79-12-28	1,020,879	40	8	1,172,879	3
124	78-0425	79-12-28	1,087,000	40	2	1,106,000	21
125	78-0492	79-12-28	1,572,600	40	4	1,887,577	27
126	78-0607	79-12-31	8,350,801	40	7	8,732,231	22
127	78-0022	80-01-25	2,674,300	40	6	3,136,291	18
128	76-7314	80-03-15	879,700	10	4	901,815	4
129	77-2655	80-03-26	4,959,943	40	4	5,157,886	29
130	79-5631	80-04-08	786,495	40	2	815,636	6
131	79-5305	80-04-25	386,963	40	7	442,666	6
132	77-2525	80-08-15	5,546,662	40	5	6,324,950	25
133	80-9715	80-09-30	767,100	40	11	2,242,287	7
134	80-9257	80-10-24	287,632	40	10	308,957	4
135	80-9531	80-12-24	311,498	40	8	429,703	2
136	79-5421	80-12-31	2,987,385	40	5	3,243,912	27
137	79-5751	81-03-16	346,777	10	22	485,530	3
138	80-9726	81-05-14	384,335	40	10	434,854	9
139	80-9044	81-05-21	234,634	40	5	254,395	1
140	77-2619	81-06-02	5,875,000	10	6	6,457,892	37
141	79-5265	81-06-30	4,415,356	40	7	4,786,170	16
142	81-8644	81-08-12	365,877	40	8	442,890	8
143	80-9194	81-08-25	1,850,000	40	13	2,296,212	9
144	81-8023	81-09-10	362,587	40	9	384,274	6
145	79-5174	81-09-30	223,710	40	3	310,840	1
146	80-9481	81-11-20	3,609,465	10	7	3,904,579	2
147	78-0012	81-12-08	3,493,000	40	6	3,585,947	7
148	78-0014	81-12-15	6,676,083	40	5	7,030,385	43
149	80-9626	82-01-18	729,000	20	12	923,527	2
150	80-9627	82-01-18	679,372	20	5	934,954	3
151	80-9173	82-01-19	640,873	30	15	907,024	3
152	80-9161	82-01-19	2,222,222	41	11	2,486,832	23
153	81-8607	82-01-21	439,889	41	7	504,256	2
154	80-9830	82-01-28	947,858	30	16	1,059,763	4
155	80-9749	82-02-26	229,448	31	24	295,166	0
156	78-0763	82-02-26	597,000	11	6	754,528	10
157	80-9519	82-03-05	283,975	20	11	322,644	1
158	79-5488	82-03-09	720,000	40	20	885,286	5
159	81-8692	82-03-12	212,444	30	14	266,976	2
160	80-9329	82-03-30	465,200	30	7	519,012	3
161	80-9688	82-03-30	269,000	10	17	326,572	3
162	81-8545	82-04-05	234,333	40	22	433,823	9
163	81-8683	82-04-21	405,330	31	6	455,465	1

164	81-0572	82-04-22	360,732	20	7	418,332	0
165	81-8605	82-05-05	218,868	10	8	248,468	1
166	81-8211	82-05-12	260,969	10	10	317,951	9
167	79-5476	82-06-01	411,237	40	13	495,313	6
168	79-5591	82-06-24	980,800	11	12	1,073,254	6
169	81-8291	82-06-30	284,833	40	14	1,019,068	7
170	79-5039	82-07-23	342,070	30	3	421,965	2
171	82-0697	82-07-30	1,095,000	40	15	1,321,655	7
172	82-0674	82-08-04	2,872,427	40	7	3,067,787	4
173	79-5490	82-09-30	598,000	10	1	749,574	0
174	77-2080	77-12-27	324,967	40	5	359,551	8
175	77-2472	77-12-30	765,277	31	6	827,879	8
176	73-5357	78-08-31	1,034,637	31	5	1,116,811	21
177	78-0514	78-09-14	327,968	40	4	365,155	5
178	78-0223	78-10-24	259,942	10	5	266,647	2
179	77-2112	78-11-07	1,158,000	20	2	1,175,794	3
180	76-7428	78-11-15	913,000	10	2	915,000	11
181	77-2077	78-12-05	825,000	10	4	884,924	5
182	77-2353	79-01-15	378,777	11	3	429,069	4
183	77-2333	79-05-04	1,472,822	40	5	1,575,865	4
184	78-0574	80-02-08	205,054	40	3	220,180	1
185	78-0840	80-04-25	483,301	40	4	554,534	1
186	79-5741	81-02-23	325,771	30	8	389,106	3
187	79-5782	81-07-24	243,188	11	9	313,677	1
188	80-9279	82-01-28	421,600	41	16	482,875	2
189	80-9183	82-02-03	492,622	41	20	595,084	6
190	79-5050	82-03-01	412,046	31	7	442,702	1
191	81-8300	82-09-16	387,132	40	14	456,297	7
192	78-0368	78-09-22	37,777	10	2	65,053	0
193	78-0254	78-09-25	97,358	11	1	97,358	2
194	78-0348	78-09-29	84,779	10	2	86,790	0
195	77-2962	78-09-29	74,062	10	4	90,801	1
196	78-0581	78-09-29	311,153	21	1	311,153	1
197	78-0222	78-11-07	218,703	10	3	253,031	2
198	78-0562	78-11-07	97,976	10	3	109,848	2
199	77-2847	78-11-17	96,400	21	2	114,100	0
200	79-5011	78-12-29	74,330	40	3	88,097	1
201	78-0877	79-02-23	72,110	11	2	83,330	1
202	78-0770	79-03-15	262,500	40	3	373,550	1
203	79-5137	79-03-23	167,855	10	1	167,855	0
204	78-0336	79-04-27	1,580,305	10	4	1,624,434	1
205	78-0410	79-07-19	217,687	11	2	245,844	1
206	79-5267	79-07-20	239,900	21	2	246,092	0
207	79-5367	79-07-23	299,840	40	4	372,516	1
208	79-5270	79-08-03	46,296	10	3	48,765	1
209	79-5572	79-08-23	54,205	11	1	54,205	1
210	78-0401	79-08-31	318,713	21	1	318,713	1
211	78-0403	79-08-31	371,773	21	1	371,773	1

212	79-5383	79-09-10	34,900	40	3	50,126	1
213	79-5768	79-09-14	3,000	11	2	6,263	0
214	79-5526	79-09-21	87,497	10	3	95,809	0
215	79-5528	79-09-27	24,900	10	4	40,952	0
216	78-0430	79-09-28	233,000	11	2	245,781	1
217	79-5705	79-09-28	170,600	10	1	170,600	0
218	79-5708	79-09-28	144,350	20	2	155,269	3
219	79-5498	79-09-28	14,966	10	5	20,415	0
220	79-5566	79-09-28	103,166	40	5	174,635	0
221	79-5592	79-09-28	410,700	10	3	498,647	1
222	79-5419	79-09-28	861,900	10	3	984,778	11
223	79-5694	79-09-28	22,620	11	3	60,208	1
224	79-5953	79-09-28	64,864	10	4	88,571	0
225	79-5618	79-10-19	50,000	21	2	67,983	0
226	79-5719	79-10-19	81,840	21	3	85,568	0
227	78-0857	79-10-19	875,000	11	2	999,391	4
228	79-5581	79-10-23	53,459	10	4	67,475	1
229	78-0786	79-10-25	62,462	10	2	64,630	0
230	78-0448	79-10-26	177,502	10	1	177,502	4
231	78-0443	79-10-26	980,995	10	2	1,399,271	3
232	79-5580	79-10-26	102,114	10	2	106,129	1
233	78-0900	78-09-00	262,900	40	3	274,707	1
234	79-5386	79-11-09	117,848	10	4	146,568	3
235	78-0668	79-12-15	725,000	40	2	767,799	2
236	79-5657	80-09-16	102,367	40	8	330,341	1
237	80-9078	80-09-25	2,238,700	40	6	3,337,251	5
238	80-9272	80-09-25	58,550	40	4	73,680	0
239	80-9271	80-09-27	115,459	40	21	152,732	1
240	80-9806	81-07-06	255,000	40	12	586,591	9
241	81-8847	82-04-15	502,201	40	11	540,316	1
242	82-0013	82-04-28	52,571	10	5	69,117	2
243	81-8322	82-04-29	2,533	40	24	5,923	0
244	81-8622	82-05-19	23,880	10	9	54,303	1
245	82-0142	82-05-27	16,843	10	13	21,858	0
246	81-8398	82-07-13	416,000	40	11	578,395	1
247	80-9017	82-07-15	100,084	40	6	92,235	2
248	82-0129	82-07-16	88,310	10	10	121,832	2
249	82-0652	82-07-27	307,928	40	2	346,614	1
250	81-8461	82-07-30	889,428	21	6	1,019,396	2
251	81-8368	82-08-05	376,512	10	10	1,325,413	1
252	81-8758	82-08-05	29,784	31	7	36,689	0
253	80-9407	82-08-06	148,785	40	10	175,664	5
254	80-9107	82-08-06	79,405	40	6	101,509	1
255	80-9668	82-08-18	317,642	10	15	406,467	0
256	81-8844	82-08-18	603,800	41	4	659,189	1
257	81-8843	82-08-18	272,600	41	2	274,880	1
258	82-0300	82-08-30	36,386	10	2	36,407	0
259	82-0662	82-08-30	99,500	41	17	152,738	2

260	81-8862	82-08-30	27,327	11	6	35,393	1
261	82-0365	82-09-07	201,902	21	3	237,499	1
262	81-0576	82-09-21	474,870	10	7	624,325	1
263	82-0734	82-09-23	19,000	10	4	27,021	0
264	79-5312	82-09-23	99,500	21	2	101,443	0
265	82-0623	82-09-23	52,255	40	7	73,897	2
266	82-0621	82-09-23	53,800	40	5	62,609	0
267	81-8617	82-09-23	277,800	40	9	310,822	4
268	81-8860	82-09-27	86,550	30	6	97,769	1
269	81-8328	82-09-29	673,439	40	14	819,598	1
270	82-0017	82-09-30	12,330	40	6	17,218	2
271	82-0712	82-09-30	212,630	40	15	251,618	2
272	82-0236	82-09-30	88,075	30	4	217,118	1
273	82-0140	82-09-30	32,045	30	7	95,517	0
274	82-0321	82-09-30	24,483	10	6	41,844	1
275	81-8431	82-09-30	49,999	10	9	75,704	0
276	82-0663	82-09-30	112,153	10	4	121,542	2
277	81-8714	82-09-30	56,960	11	8	450,112	0
278	82-0645	82-09-30	83,000	11	4	98,380	0
279	81-8724	82-09-30	199,900	11	5	233,167	2
280	82-0855	82-09-30	54,400	11	6	71,745	0
281	81-8660	82-09-30	701,000	41	3	757,575	4
282	81-8842	82-09-30	82,200	41	5	116,506	1
283	81-8141	82-09-30	62,899	10	6	206,163	1
284	82-0042	82-09-30	85,808	41	6	100,711	0
285	81-8618	82-09-30	682,820	10	4	1,509,903	12
286	82-0011	82-09-30	93,808	10	4	476,920	1
287	82-0456	82-09-30	98,648	21	6	138,934	2
288	82-0867	82-09-30	81,410	10	2	132,574	1
289	81-8364	82-09-30	527,916	10	7	661,764	2
290	82-0669	82-09-30	47,750	10	13	61,138	1
291	81-8845	82-09-30	520,101	41	14	840,234	2
292	82-0030	82-09-30	98,576	40	1	98,576	1
293	82-0763	82-09-30	3,471,960	40	11	4,332,218	15
294	82-0700	82-09-30	634,003	40	9	848,491	2
295	82-0217	82-09-30	153,400	41	11	224,192	1
296	82-0207	82-09-30	146,900	40	4	177,501	3
297	82-0106	82-09-30	24,000	40	2	29,840	2
298	82-0276	82-09-30	25,600	40	9	35,815	0
299	82-0865	82-09-30	67,600	11	2	121,000	2
300	81-8709	82-09-30	68,420	31	5	86,317	1

DATA GROUP 2

Row	Govmnt Estimate	Winning Bid	Win Bid/ Mean Bid	Win Bid/ Govt Est	Act Chg Ordr Rt	Equv Chg Ordr Rt
1	635,300	708,400	0.90758	1.11506	2.6869	2.6869
2	222,526	216,689	0.83582	0.97377	1.4131	1.6849
3	375,000	389,225	0.81395	1.03793	8.1086	17.8467
4	230,600	224,942	0.84454	0.97546	6.5513	6.5513
5	366,000	367,000	0.79673	1.00273	6.5123	6.5123
6	3,443,000	3,469,300	0.99133	1.00764	9.8960	10.9109
7	4,461,000	3,379,000	0.79115	0.75745	41.5856	41.5856
8	362,000	325,800	0.91889	0.90000	12.1421	12.1421
9	344,700	269,000	0.90471	0.78039	-1.9933	0.0
10	626,200	461,000	0.74949	0.73619	32.1789	32.1789
11	6,423,700	6,555,000	0.93617	1.02044	2.4632	2.4632
12	142,126	314,725	0.96316	2.21441	-0.2065	0.0
13	4,031,825	4,711,868	0.95025	1.16867	21.1660	23.5941
14	4,815,800	3,416,226	0.93104	0.70938	26.9870	27.0629
15	366,554	345,430	0.98361	0.94237	3.5239	3.5239
16	266,397	335,278	0.87422	1.25856	3.1425	3.1425
17	5,856,000	5,982,800	0.96883	1.02165	26.0559	26.0559
18	190,200	297,671	0.85736	1.56504	4.7031	4.7031
19	4,845,000	4,031,967	0.74973	0.83219	26.0858	26.0858
20	525,000	468,444	0.88739	0.89227	1.1606	1.1606
21	1,156,000	1,599,998	0.90480	1.38408	15.0910	16.6696
22	538,116	605,000	0.87588	1.12429	10.5119	10.5119
23	254,920	249,168	0.76121	0.97744	3.6890	3.6890
24	521,537	534,250	0.86578	1.02438	9.5311	9.5311
25	297,571	294,744	0.94758	0.99050	6.4646	6.4646
26	387,300	319,024	0.90898	0.82371	13.2638	13.4165
27	349,000	333,600	0.84954	0.95587	1.7089	2.5299
28	218,100	228,006	0.74277	1.04542	-2.5425	0.0
29	231,813	282,100	0.82130	1.21693	2.2048	2.2048
30	3,995,000	3,766,708	0.83808	0.94286	0.8481	0.8481
31	1,032,581	905,294	0.94310	0.87673	10.7224	10.7224
32	3,000,000	2,631,601	0.89329	0.87720	7.5311	7.5799
33	322,046	334,307	0.93566	1.03807	11.0144	1.0144
34	13,479,600	13,236,084	0.90528	0.98193	2.9306	3.1783
35	328,400	359,994	0.96915	1.09621	1.5917	1.5917
36	184,540	231,300	0.77709	1.25339	4.5529	4.5529
37	1,371,620	1,518,100	0.90213	1.10679	4.3079	6.0385
38	1,177,799	1,079,600	0.98797	0.91662	5.2907	5.2907
39	2,601,518	2,684,591	0.95578	1.03193	8.9961	8.9961
40	4,353,700	4,889,817	0.97609	1.12314	6.6690	6.7403
41	1,160,280	1,096,500	0.83198	0.94503	4.2268	4.2268
42	549,512	645,377	0.92381	1.17445	11.3199	11.3199

43	353,600	355,999	0.92524	1.00678	1.0834	1.6294
44	160,172	205,410	0.94787	1.28243	1.7837	1.7837
45	787,300	758,218	0.85021	0.96306	2.6881	2.7740
46	362,291	325,584	0.90832	0.89868	6.5847	6.9570
47	278,394	358,000	0.98365	1.28595	18.6346	18.6346
48	151,230	263,815	0.94296	1.74446	5.4640	5.4640
49	4,056,000	4,258,400	0.95563	1.04990	0.4553	0.5063
50	630,000	661,371	0.87876	1.04980	0.0	0.0
51	1,603,100	1,728,062	0.94209	1.07795	5.0617	5.0617
52	5,552,145	6,250,000	0.96471	1.12569	3.3809	3.9617
53	2,627,000	3,179,662	0.96700	1.21038	10.8977	10.8977
54	3,652,348	3,041,620	0.99897	0.83278	20.2570	20.3005
55	176,996	214,100	1.00000	1.20963	2.2624	2.2624
56	256,000	288,000	0.71415	1.12500	0.0	0.0
57	550,750	664,000	0.87113	1.20563	19.1958	19.3222
58	626,930	725,222	0.94959	1.15678	6.0733	7.2212
59	277,542	333,000	0.95181	1.19982	0.5077	0.5077
60	269,949	257,120	0.79234	0.95248	7.2320	7.2320
61	267,237	492,530	0.95034	1.84305	9.1054	9.1054
62	499,182	457,000	0.92869	0.91550	20.0514	20.0514
63	1,530,000	1,696,000	0.93384	1.10850	6.6193	7.0142
64	642,000	652,000	0.84658	1.01558	8.4807	8.4807
65	565,000	495,850	0.89602	0.87761	0.2761	0.2761
66	6,440,000	7,464,444	0.84743	1.15907	6.1101	6.3488
67	450,000	529,619	0.96738	1.17693	4.2917	4.2917
68	5,860,000	6,928,000	0.92844	1.18225	13.1411	13.1411
69	7,600,000	7,690,000	0.95798	1.01184	8.7537	9.2321
70	1,015,900	1,544,859	0.97426	1.52068	2.3853	2.3853
71	1,130,000	859,900	0.97475	0.76097	14.8226	14.8226
72	5,116,000	4,397,000	0.83300	0.85946	4.4240	4.4240
73	5,220,000	5,454,059	0.91841	1.04484	5.2401	5.4636
74	253,000	375,464	0.87557	1.48405	3.7636	3.7636
75	7,990,000	8,833,000	0.89445	1.10551	3.8013	40.7621
76	338,925	408,085	0.96121	1.20406	2.7373	7.6384
77	369,009	459,292	0.89862	1.24466	2.8452	2.8452
78	2,100,000	2,216,000	1.00791	1.05524	0.7164	0.7164
79	2,410,000	2,489,572	0.83323	1.03302	12.9361	18.4222
80	5,487,000	5,158,000	0.96456	0.94004	5.9033	5.9420
81	616,500	672,969	0.91506	1.09160	4.5751	4.5751
82	784,000	913,000	1.00000	1.16454	12.4626	12.4626
83	915,000	979,926	0.94434	1.07096	2.9925	2.9925
84	4,140,000	4,785,000	0.96123	1.15580	5.1764	5.1764
85	283,000	274,840	0.94987	0.97117	1.4801	1.4801
86	307,000	471,404	0.99831	1.53552	0.0	0.0
87	767,000	989,343	0.90383	1.28989	9.6237	9.6237
88	332,700	353,535	0.92024	1.06262	2.7479	2.7479
89	3,220,000	2,669,810	0.95418	0.82913	4.2197	4.3079
90	9,800,000	10,788,800	0.95715	1.10090	3.0153	5.3599

91	6,770,000	6,882,000	0.94819	1.01654	-1.1569	-0.7786
92	1,318,000	910,464	0.66436	0.69079	72.0573	72.0573
93	260,000	261,206	0.79129	1.00464	2.7969	2.7969
94	586,000	746,089	0.92583	1.27319	0.0	0.0
95	535,000	567,000	0.90602	1.05981	1.9241	1.9241
96	231,000	247,200	0.80625	1.07013	2.7002	2.7002
97	3,012,000	3,229,500	0.94259	1.07221	2.5303	3.3013
98	732,000	626,000	0.87078	0.85519	0.8704	0.8704
99	294,000	238,238	0.92264	0.81033	0.0	0.0
100	205,000	223,900	0.67046	1.09219	5.9169	5.9169
101	480,000	439,000	1.00000	0.91458	0.0	0.0
102	5,931,000	5,821,729	1.00000	0.98158	1.0983	1.0983
103	1,402,000	1,423,000	0.76953	1.01498	0.2601	0.2601
104	1,360,000	1,744,000	0.88027	1.28235	0.0772	0.0772
105	599,000	706,184	0.93692	1.17894	9.8424	9.8424
106	1,480,000	1,632,614	0.83009	1.10312	1.1416	1.1416
107	758,000	888,111	0.86216	1.17165	2.8237	2.8237
108	693,100	559,569	0.80537	0.80734	89.8906	89.8906
109	345,000	430,408	0.96868	1.24756	2.1087	2.1084
110	472,000	525,000	0.96560	1.11229	0.0	0.0
111	248,000	225,128	0.89765	0.90777	7.9949	7.9949
112	316,000	394,456	0.86951	1.24828	4.2499	4.2499
113	2,500,000	2,605,000	0.94837	1.04200	1.1522	2.0550
114	3,381,000	2,908,672	0.87545	0.86030	21.3404	21.7094
115	1,550,000	1,179,971	0.89196	0.76127	9.2684	9.2684
116	223,000	270,660	0.77432	1.21372	14.3759	14.3759
117	285,000	284,000	0.92875	0.99649	-0.4458	-0.4458
118	938,000	1,135,381	0.96528	1.21043	5.7149	5.7149
119	1,540,000	871,673	0.64475	0.56602	-0.1848	9.1147
120	328,700	268,208	0.80727	0.81597	6.4080	6.4080
121	2,770,000	3,176,693	0.92525	1.14682	-0.3258	-0.0174
122	234,000	339,700	0.89624	1.45171	11.2705	11.2705
123	1,367,100	1,020,879	0.87040	0.74675	3.3478	3.3478
124	830,000	1,087,000	0.98282	1.30964	7.9084	7.9084
125	1,240,000	1,572,600	0.83313	1.26823	11.2275	11.2275
126	7,670,000	8,350,801	0.95632	1.08876	0.0225	1.0935
127	2,982,000	2,674,300	0.85270	0.89681	28.8988	28.9848
128	772,000	879,700	0.97548	1.13951	3.2247	3.2247
129	4,550,000	4,959,943	0.96162	1.09010	6.3322	6.3322
130	499,000	786,495	0.96427	1.57614	14.1549	14.1549
131	450,000	386,963	0.87417	0.85992	7.4781	7.4781
132	4,645,835	5,546,662	0.87695	1.19390	5.3104	5.3796
133	2,090,000	767,100	0.34211	0.36703	9.8696	9.8696
134	339,000	287,632	0.93098	0.84847	11.8064	11.8064
135	379,000	311,498	0.72491	0.82189	11.9134	11.9134
136	3,740,000	2,987,385	0.92092	0.79877	7.7183	7.7355
137	495,000	419,777	0.86458	0.84803	6.3501	6.3501
138	444,000	384,335	0.88383	0.86562	12.2861	12.2861

139	271,000	234,634	0.92232	0.86581	8.2682	8.2682
140	5,750,000	5,875,000	0.90974	1.02174	6.3941	6.3941
141	4,096,000	4,415,356	0.92252	1.07797	12.3544	12.3705
142	313,200	365,877	0.82611	1.16819	27.3088	27.3088
143	4,400,000	1,850,000	0.80568	0.42045	20.7598	22.7489
144	420,000	362,587	0.94356	0.86330	7.6056	7.6056
145	487,000	223,710	0.71970	0.45936	0.1935	0.1935
146	2,800,000	3,609,465	0.92442	1.28909	2.2244	2.2244
147	2,500,000	3,493,000	0.97408	1.39720	1.6393	1.6393
148	6,931,000	6,676,083	0.94960	0.96322	8.4307	8.7968
149	1,130,000	729,000	0.78937	0.64513	3.1728	3.1728
150	627,000	679,372	0.72664	1.08353	6.8840	6.8840
151	1,130,000	640,873	0.70657	0.56714	6.9211	6.9211
152	2,920,000	2,222,222	0.89360	0.76103	5.4257	5.5584
153	443,600	439,889	0.87235	0.99163	1.0929	1.0929
154	1,500,000	947,858	0.89441	0.63191	7.2844	7.2844
155	269,000	229,448	0.77735	0.85297	0.0	0.0
156	747,000	597,000	0.79122	0.79920	7.2686	7.2686
157	300,000	283,975	0.88015	0.94658	0.3954	0.3954
158	1,102,500	720,000	0.81330	0.65306	9.0197	9.0197
159	281,000	212,444	0.79574	0.75603	4.0585	4.0872
160	468,740	465,200	0.89632	0.99245	4.3910	4.3910
161	310,000	269,000	0.82371	0.86774	5.0732	5.0732
162	540,000	351,500	0.81024	0.65093	9.9738	9.9738
163	455,300	405,330	0.88993	0.89025	0.2096	0.2096
164	440,000	360,732	0.86231	0.81985	0.0	0.0
165	266,000	218,868	0.88087	0.82281	-2.6514	-2.6514
166	327,000	260,969	0.82078	0.79807	13.9363	13.9363
167	587,000	411,237	0.83026	0.70057	14.1261	14.1261
168	1,020,000	980,800	0.91386	0.96157	5.5876	5.5876
169	1,310,000	949,444	0.93168	0.72477	17.6061	28.1315
170	383,850	342,070	0.81066	0.89116	28.8853	28.8853
171	2,203,000	1,095,000	0.82851	0.49705	18.4783	19.0284
172	3,000,000	2,872,427	0.93632	0.95748	0.8506	0.8506
173	808,000	598,000	0.79779	0.74010	0.0	0.0
174	395,450	324,967	0.90381	0.82177	16.8568	16.8568
175	623,000	765,277	0.92438	1.22837	2.7075	2.8984
176	971,000	1,034,637	0.92642	1.06554	3.4093	3.6952
177	369,000	327,968	0.89816	0.88880	33.4459	33.4459
178	258,000	259,942	0.97485	1.00753	3.2330	3.2330
179	874,872	1,158,000	0.98487	1.32362	4.5430	4.5430
180	717,979	913,000	0.99782	1.27162	8.9830	9.0720
181	545,500	825,000	0.93228	1.51237	1.4673	1.4673
182	343,000	378,777	0.88279	1.10431	5.4116	5.4116
183	1,246,600	1,472,822	0.93461	1.18147	3.8702	3.8702
184	209,000	205,054	0.93130	0.98112	8.9986	8.9986
185	431,000	483,301	0.87154	1.12135	1.2315	1.2315
186	376,000	325,771	0.83723	0.86641	4.2143	4.2143

187	2,010,000	243,188	0.77528	0.12099	1.5349	1.5349
188	611,000	421,600	0.87310	0.69002	0.8849	0.8849
189	711,000	492,622	0.82782	0.69286	5.5372	5.5372
190	389,500	412,046	0.93075	1.05788	-0.0408	0.0
191	609,000	387,132	0.84842	0.63568	5.1811	5.1811
192	43,600	37,777	0.58071	0.86644	0.0	0.0
193	70,000	97,358	1.00000	1.39083	-5.1320	5.0571
194	43,600	84,779	0.97683	1.94447	0.0	0.0
195	99,500	75,375	0.83011	0.75754	2.2953	2.2953
196	358,500	311,153	1.00000	0.86793	0.5193	0.5193
197	258,650	218,703	0.86433	0.84556	71.7269	86.8881
198	117,800	97,976	0.89192	0.83171	38.1215	38.1215
199	50,400	96,400	0.84487	1.91270	0.0	0.0
200	57,400	74,330	0.84373	1.29495	3.1064	3.1064
201	57,400	72,110	0.86536	1.25627	1.1815	1.1815
201	57,400	72,110	0.86536	1.25627	1.1815	1.1815
202	207,723	262,500	0.70272	1.26370	3.5858	3.5858
203	107,000	167,855	1.00000	1.56874	0.0	0.0
204	1,640,000	1,580,305	0.97283	0.96360	8.1100	8.1100
205	250,000	217,687	0.88547	0.87075	23.9283	23.9283
206	198,000	239,900	0.97484	1.21162	0.0	0.0
207	232,000	299,840	0.80491	1.29241	1.5582	1.5582
208	37,200	46,296	0.94937	1.24452	4.7930	4.7930
209	33,400	54,205	1.00000	1.62290	0.7914	0.7914
210	323,000	318,713	1.00000	0.98673	1.3925	1.3925
211	276,000	371,773	1.00000	1.34700	0.1420	0.1420
212	33,300	34,900	0.69625	1.04805	-1.5759	0.0
213	9,500	3,000	0.47900	0.31579	0.0	0.0
214	65,600	87,497	0.91324	1.33380	0.0	0.0
215	28,000	24,900	0.60803	0.88929	0.0	0.0
216	242,000	233,000	0.94800	0.96281	-1.9296	0.0
217	136,620	170,600	1.00000	1.24872	0.0	0.0
218	78,900	144,350	0.92968	1.82953	0.8728	1.3744
219	22,200	14,966	0.73309	0.67414	0.0	0.0
220	106,000	103,166	0.59075	0.97326	0.0	0.0
221	497,000	410,700	0.82363	0.82636	10.8595	10.8595
222	939,000	861,900	0.87522	0.91789	12.3989	12.3989
223	50,000	46,200	0.76734	0.92400	3.0946	3.0946
224	45,000	64,864	0.73234	1.44142	0.0	0.0
225	32,000	50,000	0.73548	1.56250	0.0	0.0
226	66,000	81,840	0.95643	1.24000	0.0	0.0
227	902,000	875,000	0.87553	0.97007	4.9679	4.9679
228	136,000	53,459	0.79228	0.39308	21.3827	21.3827
229	74,100	62,462	0.96646	0.84294	0.0	0.0
230	90,200	177,502	1.00000	1.96787	4.8592	4.8592
231	1,050,000	980,995	0.70108	0.93428	23.4899	23.4899
232	271,000	102,114	0.96217	0.37680	40.9914	40.9914
233	337,000	262,900	0.95702	0.78012	2.2396	2.2396

234	275,800	117,848	0.80405	0.42730	27.2342	27.2342
235	655,000	725,000	0.94426	1.10687	0.5237	0.6896
236	382,000	102,367	0.30988	0.26798	3.6105	3.6105
237	4,250,000	2,238,700	0.67082	0.52675	0.9283	4.7353
238	58,300	58,550	0.79465	1.00429	0.0	0.0
239	145,000	115,459	0.75596	0.79627	35.2583	35.2583
240	702,000	255,000	0.43472	0.36325	20.8313	21.2960
241	807,000	502,201	0.92946	0.62231	47.1124	47.1124
242	64,700	52,571	0.76061	0.81253	3.2680	3.2680
243	7,670	2,533	0.42770	0.33028	0.0	0.0
244	48,100	23,880	0.43975	0.49647	16.5619	16.5619
245	24,700	16,843	0.77056	0.68190	0.0	0.0
246	648,000	416,000	0.71923	0.64198	4.8862	4.8862
247	94,840	100,084	1.08510	1.05530	-28.7677	30.2664
248	73,500	88,310	0.72485	1.20150	5.6222	5.6222
249	404,000	307,928	0.88839	0.76220	10.5641	10.5641
250	1,210,000	889,428	0.87251	0.73506	10.4371	10.4371
251	1,440,000	961,788	0.72565	0.66791	13.1921	13.1921
252	58,800	29,784	0.81180	0.50653	0.0	0.0
253	190,000	148,785	0.84699	0.78308	31.0723	31.0723
254	99,330	79,405	0.78225	0.79941	8.3117	8.3117
255	325,000	317,642	0.78147	0.97736	0.0	0.0
256	698,000	603,800	0.91597	0.86504	0.7651	0.7651
257	189,000	272,600	0.99171	1.44233	1.2582	1.2582
258	37,400	36,386	0.99942	0.97289	0.0	0.0
259	156,000	99,500	0.65144	0.63782	21.3115	21.3115
260	31,000	27,327	0.77209	0.88150	4.7901	4.7901
261	299,000	201,902	0.85012	0.67526	2.8469	2.8469
262	543,000	474,870	0.76061	0.87453	-1.5773	0.0
263	25,500	19,000	0.70316	0.74510	0.0	0.0
264	105,000	99,500	0.98085	0.94762	0.0	0.0
265	57,400	52,255	0.70713	0.91037	26.3592	26.3592
266	77,700	53,800	0.85930	0.69241	0.0	0.0
267	368,000	277,800	0.89376	0.75489	20.6828	20.6828
268	88,200	86,550	0.88525	0.98129	7.3945	7.3945
269	1,170,000	673,439	0.82167	0.57559	23.3345	23.3345
270	23,000	12,330	0.71611	0.53609	36.3747	36.3828
271	353,000	212,630	0.84505	0.60235	8.0962	8.0962
272	162,000	195,000	0.89813	1.20370	0.6358	0.6358
273	91,500	72,578	0.75984	0.79320	0.0	0.0
274	41,400	24,483	0.58510	0.59138	6.5351	6.5351
275	98,200	49,999	0.66045	0.50915	0.0	0.0
276	145,000	112,153	0.92275	0.77347	5.9071	5.9071
277	289,000	325,000	0.72204	1.12457	0.0	0.0
278	93,800	83,000	0.84367	0.88486	0.0	0.0
279	182,000	199,900	0.85733	1.09835	6.5032	6.5032
280	57,200	54,400	0.75824	0.95105	0.0	0.0
281	610,000	701,000	0.92532	1.14918	4.5389	4.5389

282	93,000	82,200	0.70554	0.88387	8.8041	8.8041
283	146,000	192,887	0.93560	1.32114	3.5453	3.5453
284	90,100	85,808	0.85202	0.95236	0.0	0.0
285	671,000	682,820	0.45223	1.01762	1.4899	1.4899
286	420,000	433,651	0.90927	1.03250	0.9974	0.9974
287	148,000	98,648	0.71004	0.66654	17.8766	17.8766
288	42,300	81,410	0.61407	1.92459	7.8393	7.8393
289	1,010,000	527,916	0.79774	0.52269	3.8117	3.8117
290	66,900	47,750	0.78102	0.71375	1.5979	1.5979
291	740,000	520,101	0.61900	0.70284	12.6962	12.6962
292	88,100	98,576	1.00000	1.11891	0.6056	0.6056
293	5,790,000	3,471,960	0.80143	0.59965	10.8237	12.3491
294	821,000	634,003	0.74721	0.77223	35.7499	35.7499
295	303,000	153,400	0.68424	0.50627	7.2281	7.2281
296	181,900	146,900	0.82760	0.80759	3.8263	3.8263
297	32,000	24,000	0.80429	0.75000	22.2208	22.2208
298	35,400	25,600	0.71478	0.72316	0.0	0.0
299	46,600	67,600	0.55868	1.45064	12.1375	12.1375
300	72,500	68,420	0.79266	0.94372	5.0073	5.0073

DATA GROUP 3

Row	Contract Number	2nd Low Bid	No. Std Dev Bid fm Mean	Bid Spread	Act Chg Ordr Rt	Equv Chg Ordr Rt
1	76-7344	747,478	1.18900	5.516	2.6869	2.6869
2	76-7180	260,700	1.58300	15.897	6.5513	6.5513
3	77-2276	438,558	1.48500	19.498	6.5123	6.5123
4	76-7178	525,372	1.65700	13.964	32.1789	32.1789
5	75-6305	6,611,778	1.62300	0.866	2.4632	2.4632
6	76-7162	3,473,002	1.30500	1.662	26.9870	27.0629
7	77-2222	366,577	0.94300	9.335	3.1425	3.1425
8	76-7150	6,116,443	1.77300	2.234	26.0559	26.0559
9	77-2971	341,560	1.35400	14.744	4.7031	4.7031
10	75-6468	4,986,820	1.23900	23.682	26.0858	26.0858
11	76-7236	1,648,971	0.86000	3.061	15.0910	16.6696
12	76-7328	653,635	1.44400	8.039	10.5119	10.5119
13	77-2674	271,235	1.06200	8.856	3.6890	3.6890
14	77-2657	295,314	0.82200	0.193	6.4646	6.4646
15	77-2678	319,172	1.03700	0.046	13.2638	13.4165
16	78-0455	359,802	1.06200	7.854	1.7089	2.5299
17	77-2738	279,432	1.17900	22.555	2.5425	0.0
18	77-2570	339,999	1.32300	20.524	2.2048	2.2048
19	78-0243	959,918	1.62900	6.034	10.7224	10.7224
20	75-6547	2,773,867	1.06300	5.406	7.5311	7.5799

21	78-0539	352,375	1.27500	5.405	11.0144	11.0144
22	77-2431	14,194,373	1.03900	7.240	2.9306	3.1783
23	77-2073	1,538,948	1.28700	1.373	4.3079	6.0385
24	76-7299	4,949,937	0.75900	1.229	6.6690	6.7403
25	77-2057	1,127,629	1.23500	2.839	4.2268	4.2268
26	78-0638	373,853	1.48400	5.015	1.0834	1.6294
27	78-0284	217,268	1.41300	5.773	1.7837	1.7837
28	77-2533	799,967	1.00700	5.506	2.6881	2.7740
29	77-2750	355,114	1.13400	9.070	6.5847	6.9570
30	77-2269	1,797,001	1.50500	3.989	5.0617	5.0617
31	78-0093	315,877	1.12000	9.680	0.0	0.0
32	78-0502	758,899	1.38700	14.292	19.1958	19.3222
33	75-6475	726,016	0.89400	0.109	6.0733	7.2212
34	78-0423	324,466	1.70200	26.193	7.2320	7.2320
35	76-7204	465,580	0.97600	1.877	20.0514	20.0514
36	76-7142	1,800,026	1.14000	6.134	6.6193	7.0142
37	74-3952	693,193	1.31600	6.318	8.4807	8.4807
38	75-6315	8,254,633	1.60200	10.586	6.1101	6.3488
39	77-2164	7,334,913	1.25200	5.873	13.1411	13.1411
40	77-2170	7,849,991	1.16000	2.080	8.7537	9.2321
41	77-2889	874,908	0.95300	1.745	14.8226	14.8226
42	77-2051	5,783,983	1.73000	6.049	5.2401	5.4636
43	77-2174	9,785,024	1.79300	10.778	3.8013	40.7621
44	78-0880	487,757	1.09200	6.197	2.8452	2.8452
45	77-2909	2,747,684	1.97300	10.368	12.9361	18.4222
46	77-2563	5,198,636	1.28600	0.788	5.9033	5.9420
47	79-5279	711,014	1.06400	5.653	4.5751	4.5751
48	77-2520	988,094	0.92000	0.834	2.9925	2.9925
49	78-0895	4,794,004	0.88000	0.188	5.1764	5.1764
50	78-0698	274,998	0.88500	0.057	1.4801	1.4801
51	79-5251	2,736,659	1.00100	2.504	4.2197	4.3079
52	78-0544	11,330,104	1.74700	5.017	3.0153	5.3599
53	77-2996	7,144,389	1.46300	3.813	1.1569	0.7786
54	79-5247	1,047,507	1.81800	15.052	72.0573	72.0573
55	79-5149	764,674	1.04300	2.491	0.0	0.0
56	77-2787	585,861	2.11100	3.326	1.9241	1.9241
57	79-5287	1,506,017	0.96600	5.834	0.2601	0.2601
58	78-0576	1,808,154	1.39900	10.752	1.1416	1.1416
59	76-7131	1,037,153	1.41000	16.782	2.8237	2.8237
60	78-0089	684,225	1.27900	22.277	89.8906	89.8906
61	78-0265	229,157	1.20300	1.790	7.9949	7.9949
62	76-7160	2,733,041	1.66700	4.915	1.1522	2.0550
63	75-6679	3,180,054	1.46400	9.330	21.3404	21.7094
64	79-5099	1,228,029	1.06700	4.073	9.2684	9.2684
65	77-2061	1,137,004	0.82500	0.143	5.7149	5.7149
66	79-5165	1,340,527	0.93300	53.788	0.1848	9.1147
67	79-5588	375,414	1.35900	10.513	11.2705	11.2705
68	77-2126	1,061,382	1.14100	3.967	3.3478	3.3478

69	76-7314	904,803	1.46500	2.854	3.2247	3.2247
70	77-2525	5,643,011	1.03700	1.737	5.3104	5.3796
71	79-5751	424,296	1.03000	1.076	6.3501	6.3501
72	77-2619	6,190,024	1.22900	5.362	6.3941	6.3941
73	80-9481	3,778,575	1.64600	4.685	2.2244	2.2244
74	78-0012	3,494,191	0.71800	0.034	1.6393	1.6393
75	80-9626	912,979	1.54600	25.237	3.1728	3.1728
76	80-9627	865,516	1.54600	27.399	6.8840	6.8840
77	80-9173	691,075	1.45300	7.833	6.9211	6.9211
78	80-9161	2,226,798	1.50900	0.206	5.4257	5.5584
79	81-8607	449,403	1.42100	2.163	1.0929	1.0929
80	80-9830	951,990	1.44700	0.436	7.2844	7.2844
81	80-9749	246,908	1.75500	7.610	0.0	0.0
82	78-0763	728,032	1.68800	21.948	7.2686	7.2686
83	80-9519	302,992	1.83400	6.697	0.3954	0.3954
84	79-5488	724,420	0.67400	0.614	9.0197	9.0197
85	81-8692	216,659	1.38100	1.984	4.0585	4.0872
86	80-9329	470,583	0.80100	1.157	4.3910	4.3910
87	80-9688	280,898	1.32700	4.423	5.0732	5.0732
88	81-8545	352,876	1.14500	0.391	9.9738	9.9738
89	81-8683	427,489	1.19500	5.467	0.2096	0.2096
90	81-0572	378,012	1.35600	4.790	0.0	0.0
91	81-8605	219,005	0.70400	0.063	2.6514	2.6514
92	81-8211	278,884	1.05200	6.865	13.9363	13.9363
93	79-5476	416,879	1.14900	1.372	14.1261	14.1261
94	79-5591	998,027	1.32700	1.756	5.5876	5.5876
95	81-8291	968,661	0.73200	2.024	17.6061	28.1315
96	82-0697	1,112,076	1.26300	1.559	18.4783	19.0284
97	82-0674	2,937,054	1.09800	2.250	0.8506	0.8506
98	79-5490	670,846	1.65800	12.182	0.0	0.0
99	77-2080	336,827	1.15200	3.650	16.8568	16.8568
100	77-2472	787,843	0.90800	2.949	2.7075	2.8984
101	73-5357	1,106,250	1.49400	6.921	3.4093	3.6952
102	78-0514	370,968	1.43900	13.111	33.4459	33.4459
103	78-0223	263,816	1.24400	1.490	3.2330	3.2330
104	77-2077	864,972	1.02700	4.845	1.4673	1.4673
105	77-2333	1,542,958	1.28800	4.762	3.8702	3.8702
106	79-5782	259,710	1.28000	6.794	1.5349	1.5349
107	80-9279	429,184	1.23900	1.799	0.8849	0.8849
108	80-9183	530,023	1.84300	7.592	5.5372	5.5372
109	79-5050	421,346	1.10200	2.257	0.0408	0.0
110	81-8300	391,786	1.51600	1.202	5.1811	5.1811
111	77-2962	85,570	1.37100	13.526	2.2953	2.2953
112	78-0336	1,607,035	0.96600	1.691	8.1100	8.1100
113	79-5367	310,075	0.74700	3.413	1.5582	1.5582
114	79-5528	37,908	1.13400	52.241	0.0	0.0
115	79-5498	16,730	1.27200	11.785	0.0	0.0
116	79-5566	123,909	1.07900	20.107	0.0	0.0

117	79-5953	79,001	0.97100	21.795	0.0	0.0
118	79-5581	63,500	1.24800	18.782	21.3827	21.3827
119	79-5386	145,039	1.33300	23.073	27.2342	27.2342
120	81-8847	516,117	2.02200	2.771	47.1124	47.1124
121	82-0013	60,935	0.92200	15.910	3.2680	3.2680
122	81-8322	3,777	1.78500	49.106	0.0	0.0
123	81-8622	24,465	1.60700	2.452	16.5619	16.5619
124	82-0142	18,399	1.22800	9.241	0.0	0.0
125	81-8398	452,022	1.54100	8.659	4.8862	4.8862
126	80-9017	71,303	1.11900	28.757	28.7677	30.2664
127	82-0129	94,597	1.33100	7.119	5.6222	5.6222
128	81-8461	1,028,532	2.00600	15.640	10.4371	10.4371
129	81-8368	1,118,092	1.71200	16.251	13.1921	13.1921
130	81-8758	29,986	1.34400	0.677	0.0	0.0
131	80-9407	155,686	1.52200	4.638	31.0723	31.0723
132	80-9107	86,849	1.10700	9.374	8.3117	8.3117
133	80-9668	343,001	1.45000	7.984	0.0	0.0
134	81-8844	625,896	0.72500	3.659	0.7651	0.7651
135	82-0662	110,007	1.55600	10.560	21.3115	21.3115
136	81-8862	32,486	1.14300	18.880	4.7901	4.7901
137	81-0576	476,023	1.05200	0.243	1.5773	0.0
138	82-0734	25,958	1.32800	36.622	0.0	0.0
139	82-0623	53,306	0.96100	2.011	26.3592	26.3592
140	82-0621	61,360	1.47400	14.052	0.0	0.0
141	81-8617	281,481	0.76000	1.325	20.6828	20.6828
142	81-8860	89,063	1.31700	2.903	7.3945	7.3945
143	81-8328	706,027	0.98100	4.839	23.3345	23.3345
144	82-0017	16,392	1.22500	32.945	36.3747	36.3828
145	82-0712	223,046	1.44600	4.899	8.0962	8.0962
146	82-0236	199,452	0.87600	2.283	0.6358	0.6358
147	82-0140	77,078	1.34500	6.200	0.0	0.0
148	82-0321	28,990	1.28400	18.409	6.5351	6.5351
149	81-8431	65,683	1.77200	31.368	0.0	0.0
150	82-0663	115,254	1.01700	2.765	5.9071	5.9071
151	81-8714	389,770	1.33900	19.929	0.0	0.0
152	82-0645	86,530	0.80800	4.253	0.0	0.0
153	81-8724	224,188	1.30400	12.150	6.5032	6.5032
154	82-0855	58,001	1.10900	6.620	0.0	0.0
155	81-8842	115,982	1.70100	41.097	8.8041	8.8041
156	81-8141	194,474	1.04400	0.823	3.5453	3.5453
157	82-0042	91,750	1.02200	6.925	0.0	0.0
158	81-8618	1,466,030	1.12600	114.702	1.4899	1.4899
159	82-0011	462,485	1.20200	6.649	0.9974	0.9974
160	82-0456	123,132	1.27500	24.819	17.8766	17.8766
161	81-8364	560,340	1.30100	6.142	3.8117	3.8117
162	82-0669	49,178	1.41200	2.991	1.5979	1.5979
163	81-8845	642,574	1.67000	23.548	12.6962	12.6962
164	82-0763	3,762,502	1.55500	8.368	10.8237	12.3491

165	82-0700	683,637	1.68100	7.829	35.7499	35.7499
166	82-0217	159,238	1.17700	3.806	7.2281	7.2281
167	82-0207	169,000	1.10400	15.044	3.8263	3.8263
168	82-0276	30,790	1.36700	20.273	0.0	0.0
169	81-8709	78,439	1.47700	14.643	5.0073	5.0073

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